

# Service Service Service

**LC03E**  
**AA**



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150403

# Service Manual

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**PHILIPS**

# 1. Technical Specifications, Connections and Chassis Overview

## 1.1 Technical Specifications

### 1.1.1 Reception

Tuning system	: PLL
Colour systems	: PAL B/G, : PAL D/K, : SECAM B/G, : SECAM D/K
Sound system 15" model	: BI NICAM BG : 2CS BG FM/FM (5.5-5.74) : NICAM B/G (5.5-5.85) : NICAM D/K (6.5-5.85)
Sound system 17" model	: BI NICAM BG : 2CS BG FM/FM (5.5-5.74) : NICAM B/G (5.5-5.85) : NICAM D/K (6.5-5.85) : NICAM I (6.0-6.52) : NICAM L (6.5-5.85)
Built-in radio type	: FM
Speakers	: Full range
Distortion at rated power	: RMS power: 2 x 3 W : < 10 % (input via EXT1)
Frequency bands	: UVSH
IF Freq.	: 38.9 MHz
A/V connections 17"	: NTSC 3.58 : NTSC 4.43 : NTSC Play Back : PAL 60, PAL B/G Play Back : SECAM Play Back
Channel selections	: 125 channels : full cable, UVSH
Aerial input	: 75 Ohm : Coax
Pixel format	: 15": 1024x768 (XGA) : 17": 1280x768 (WXGA)
Viewing angle	: 15": 160 degrees : 17": 176 degrees

### 1.1.2 Miscellaneous

Mains voltage 15"/17"	: External power Supply : Input: 100-240 V_ac, 1.5 A : Output: 12 V_dc, 60 W
Mains frequency	: 50/60 Hz
Operating temperature	: + 5 to + 35 deg. C
Storage temp.	: -20 to 60 deg. C.
Maximum humidity	: 90 % R.H. max
Power dissipation	: 15": 47 W : 17": 51 W
Standby Power dissipation	: 1 W
Weight	: 15": 6.2 Kg : 17": 6.4 Kg
Dim. 15" model (WxHxD)	: 517 x 307 x 65 mm
Dim. 17" model (WxHxD)	: 480 x 302 x 65 mm

## 1.2 Connections

### 1.2.1 Front and Top Controls

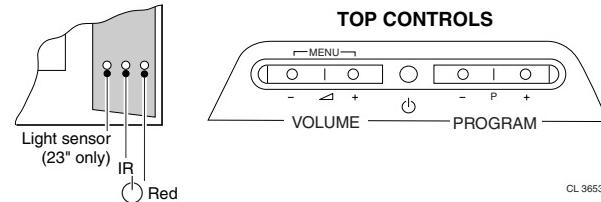
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Figure 1-1 Left side connections

### 1.2.2 Left Side Connections (Front View)

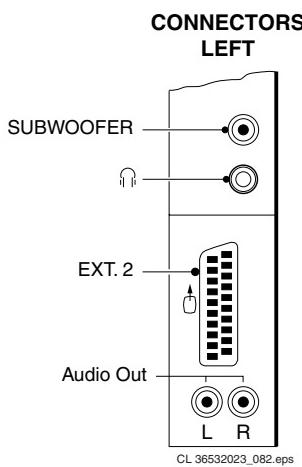
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150403

Figure 1-2 Left side connections

#### Audio/Video - Out

- 1 - Sub woofer out var. level 1x  
2 - Headphone 32 - 600 Ohm/10 mW



#### SCART EXT/2 (CVBS +YC) Only for 17" and 23"

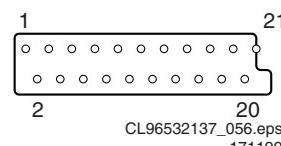
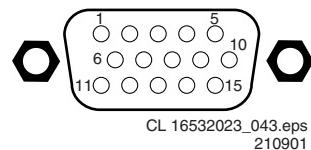
CL96532137\_056.eps  
171199

Figure 1-3 SCART connector

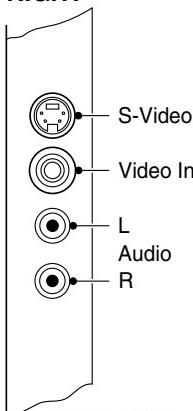
1 - Audio - R	0.5 Vrms/10 kOhm
2 - Audio - R	0.5 Vrms/10 kOhm
3 - Audio - L	Ground
4 - Audio	Ground
5 - Blue	Ground
6 - Audio - L	0.5 Vrms/10 kOhm
7 - N.C.	
8 - CVBS-status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3
9 - Green	Ground
10 - P50	
11 - N.C.	
12 - N.C.	
13 - Red	Ground
14 - Blanking	Ground



15 - C	1 Vpp/75 Ohm	
16 - N.C.		
17 - Video in/out	Ground	
18 - RGB sw. ctrl	Ground	
19 - CVBS	1 Vpp/75 Ohm	
20 - CVBS	1 Vpp/75 Ohm	
21 - Common	Ground	

**VGA- in (Sub-D)**CL 16532023\_043.eps  
210901**Audio - Out**

1 - Audio - R	0.5 Vrms/10 kOhm	
3 - Audio - L	0.5 Vrms/10 kOhm	

**Figure 1-6 VGA Connector****1.2.3 Right Side Connections (Front View)****CONNECTORS****RIGHT**CL 36532023\_081.eps  
150403**Figure 1-4 Right side connections****S-Video - In (Hosiden)**

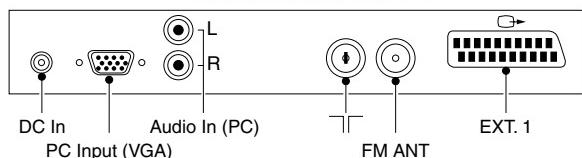
1 - Y	Ground	
2 - C	Ground	
3 - Y	1 Vpp/75 Ohm	
4 - C	0.3 Vpp/75 Ohm	

**Video - In (Cinch)**

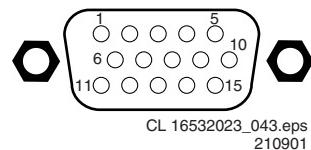
1 - CVBS	1 Vpp/75 Ohm	
----------	--------------	--

**Audio - In (Cinch)**

1 - Audio - L	0.5 Vrms/10 kOhm	
2 - Audio - R	0.5 Vrms/10 kOhm	

**1.2.4 Bottom Connections****CONNECTORS BOTTOM**CL 36532023\_066.eps  
150403**Figure 1-5 Bottom connections****DC - In**

1 -	12 V_dc/5A/60W	
-----	----------------	--

**VGA- in (Sub-D)**CL 16532023\_043.eps  
210901**Audio - Out**

1 - Audio - R	0.5 Vrms/10 kOhm	
3 - Audio - L	0.5 Vrms/10 kOhm	

**Figure 1-6 VGA Connector**

1 - Red	0.7 Vpp/75 Ohm	
2 - Green	0.7 Vpp/75 Ohm	
3 - Blue	0.7 Vpp/75 Ohm	
4 - Sense	Ground	
5 -	Ground	
6 - Red	Ground	
7 - Green	Ground	
8 - Blue	Ground	
9 -	+5V	
10 - Sync	Ground	
11 - Sense	Ground	
12 - Bi-direct. data		
13 - H-sync		
14 - V-sync		
15 - Data clock		

**Audio - PC In**

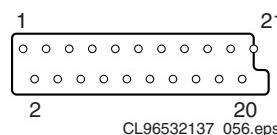
1 - Audio - R	0.5 Vrms/10 kOhm	
2 - Audio - L	0.5 Vrms/10 kOhm	

**Aerial - In (IEC)**

1 - IEC type	75 Ohm, coax	
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**FM Ant (IEC)**

1 - IEC type	75 Ohm, coax	
--------------	--------------	--

**SCART EXT1 - In/Out (RGB/YUV and CVBS)**CL96532137\_056.eps  
171199**Figure 1-7 SCART connector**

1 - Audio - R	0.5 Vrms/10 kOhm	
2 - Audio - R	0.5 Vrms/10 kOhm	
3 - Audio - L	0.5 Vrms/10 kOhm	
4 - Audio	Ground	
5 - Blue	Ground	
6 - Audio - L	0.5 Vrms/10 kOhm	
7 - Blue	0.7 Vpp/75 Ohm	
8 - CVBS-status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	
9 - Green	Ground	
10 - N.C.		
11 - Green	0.7 Vpp/75 Ohm	
12 - N.C.		
13 - Red	Ground	
14 - Blanking	Ground	
15 - Red	0.7 Vpp/75 Ohm	
16 - RGB-stat/FBL	0 - 0.4 V: INT 1 - 3 V: EXT/75 Ohm	
17 - Video in/out	Ground	
18 - RGB sw. ctrl	Ground	
19 - CVBS-out	1 Vpp/75 Ohm	
20 - CVBS-in	1 Vpp/75 Ohm	
21 - Common	Ground	

## 1.3 Chassis Overview

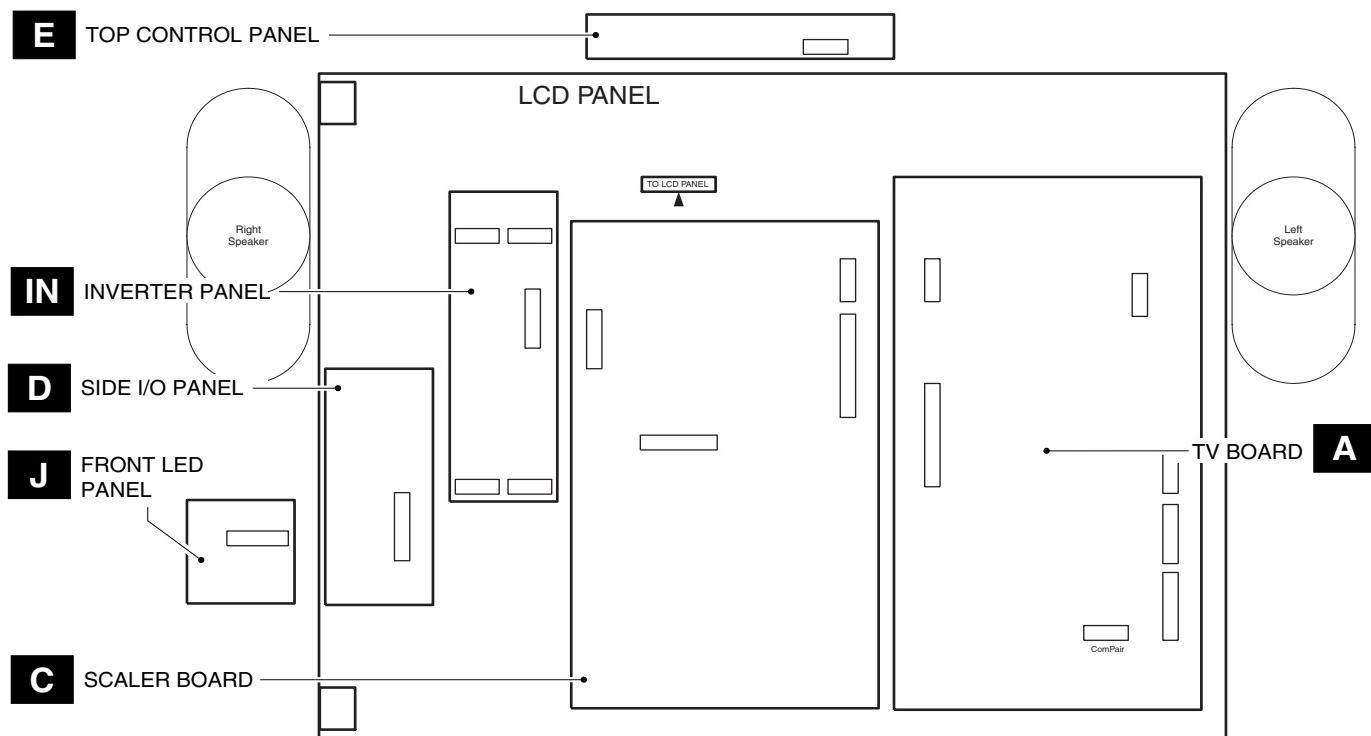
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Figure 1-8 Chassis Overview

## 2. Safety Instructions, Warnings, and Notes

### 2.1 Safety Instructions

Safety regulations require that **during** a repair:

- Always connect the set to the mains via an isolation transformer ( $\geq 800$  VA).
- Replace safety components, indicated by the symbol  $\Delta$ , only by components identical to the original ones.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay, in particular, attention to the following points:

- Route the wire trees and HT cables correctly and fix them with the mounted cable clamps.
- Check the insulation of the mains lead for external damage.
- Check the cabinet for defects, to avoid touching of any inner parts by the customer.

### 2.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD  $\Delta$ ). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.

Available ESD protection equipment:

- Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
- Wristband tester 4822 344 13999.
- Be careful during measurements in the high voltage section (on the inverter panel).
- Never replace modules or other components while the unit is switched 'on'.
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

### 2.3 Notes

#### 2.3.1 General

- Clean the LCD display with a slightly humid cloth.
- Measure the direct voltages and oscilloscopes with regard to the chassis ground ( $\ominus$ ), or hot ground ( $\oplus$ ) as this is called.
- The direct voltages and oscilloscopes shown in the diagrams are indicative. Measure them in the Service Default Mode (see section "Service Modes").
- Where necessary, measure the voltages in the power supply section both in normal operation (I) and in standby (S). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

#### 2.3.2 Schematic Notes

- All resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kOhm).
- Resistor values with no multiplier may be indicated with either an 'E' or an 'R' (e.g. 220E or 220R indicates 220 Ohm).
- All Capacitor values are expressed in Micro-Farads ( $\mu= \times 10^{-6}$ ), Nano-Farads ( $n= \times 10^{-9}$ ), or Pico-Farads ( $p= \times 10^{-12}$ ).

- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An 'asterisk' (\*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

#### 2.3.3 Rework on BGA ICs

##### **General**

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF) BGA has to be discarded.

##### **Device Removal**

As is the case with any component, it is essential when removing an (LF) BGA that the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the chance of warping the PWB. To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

##### **Area Preparation**

When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA. Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent. After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF) BGA.

**Note:** Do not apply solder paste, as this has shown to result in problems during re-soldering.

##### **Device Replacement**

The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. To reflow the solder, apply a temperature profile according to the IC data sheet. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times

### 3. Directions for Use

#### Presentation of the LCD Television

##### Introduction

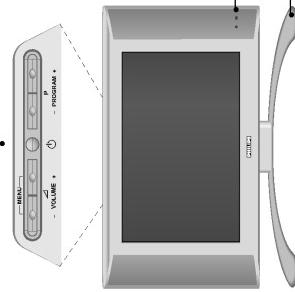
Thank you for purchasing this television set.  
This handbook has been designed to help you install and operate your TV set.  
We would strongly recommend that you read it thoroughly.  
We hope our technology meets entirely with your satisfaction.

##### Table of Contents

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##### Television keys:

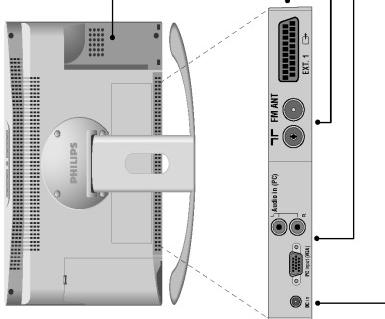
- Obj: to switch the TV on or off.
  - VOLUME - + (- P -) : to adjust sound level.
  - PROGRAM - + (- P +): to select programmes.
  - MENU: to access or close menus, simultaneously press the  $\Delta$  - and  $\Delta$  + keys. The  $\Delta$  - keys can be used to select an adjustment and the  $\Delta$  + keys to make that adjustment.
- Note:* when the Child LOCK function is activated the  $\Delta$  + and  $\Delta$  - keys are unavailable (refer to FEATURES menu on page 10).



##### On-light and infrared sensors.

- Adjustable stand.  
The stand can be removed and replaced with a wall mounting kit available as an option (ask your dealer).

##### Rear of set :



- The main connections are made at the bottom of the television.  
Removable panels to left\* and right access the supplementary connection sockets.  
\*The large screen sizes do not have a left panel. For more details on connections see page 14.

- TV and radio aerial sockets

- VGA and audio input for connecting a computer.

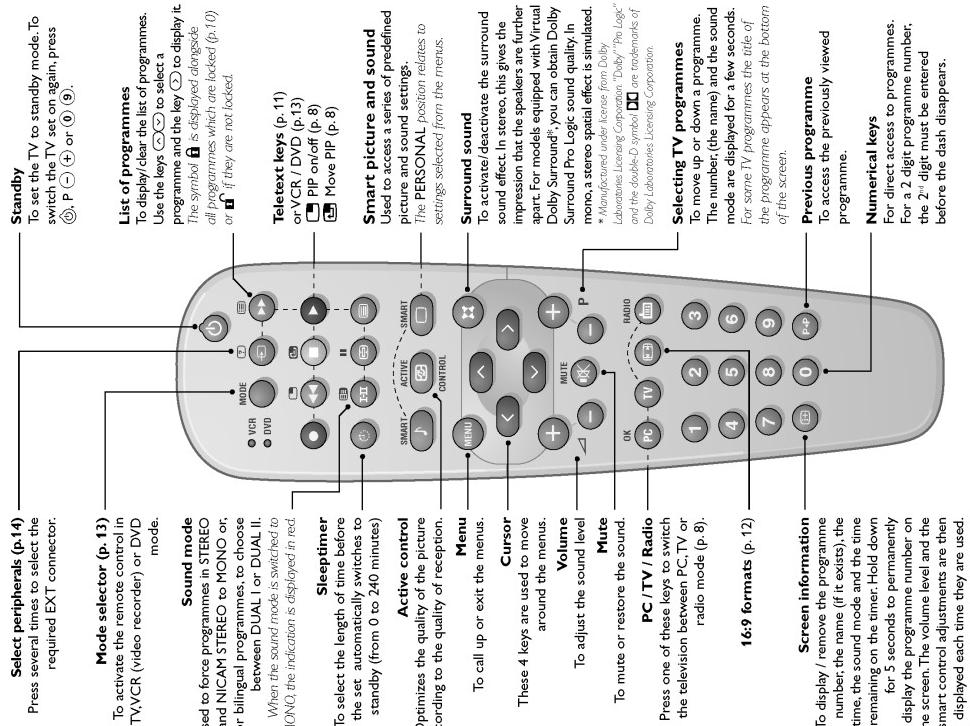
- DC supply socket

#### English

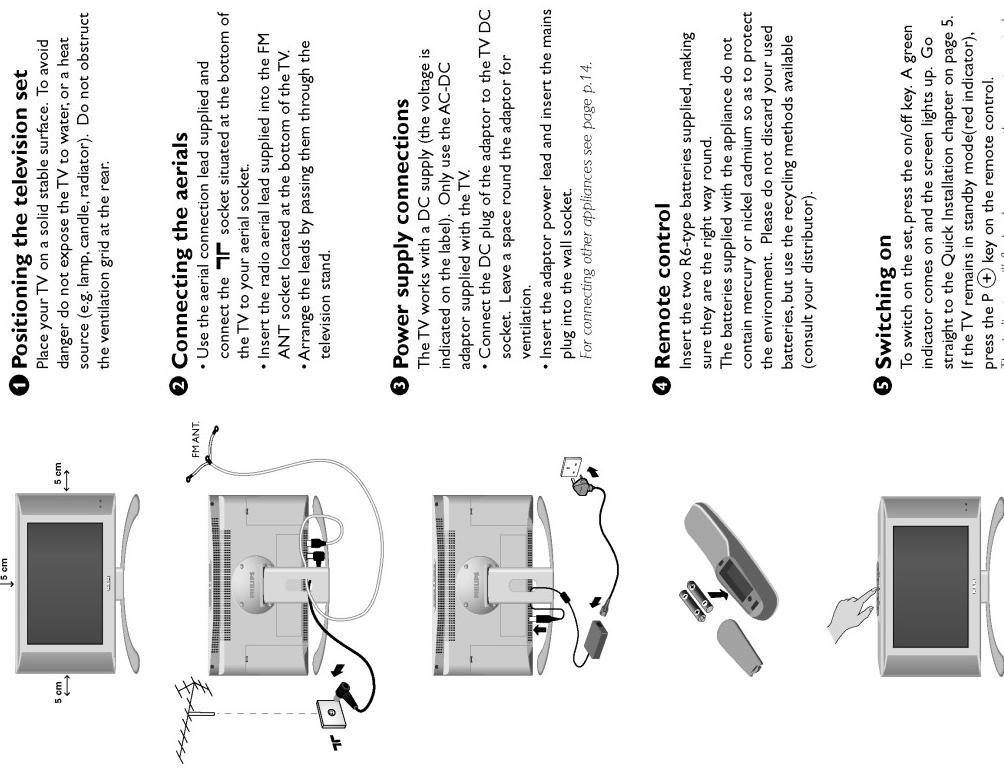
**Recycling**  
The materials used in your set are either reusable or can be recycled.  
To minimise environmental waste, specialist companies collect used appliances and dismantle them after retrieving any materials that can be used again (ask your dealer for further details).



## Remote control keys

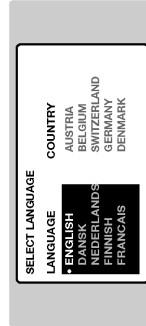


## Installing your television set



## Quick installation

The first time you switch on the television, a menu appears on the screen. This menu asks you to choose the language of the menus :



If the menu does not appear, hold down the  $\Delta$  - and  $\nabla$  keys on the set for 5 seconds to bring it up.

- ① Use the  $\circlearrowleft$   $\circlearrowright$  keys on the remote control to choose your language, then confirm with  $\odot$ .
- ② Then select your country using the  $\circlearrowleft$   $\circlearrowright$  keys and confirm with  $\odot$ .
- ③ If your country does not appear in the list, select "..."

See also: EasyLink function, page 6.

## Sorting programmes

- ① Press the  $\text{INFO}$  key. The main menu is displayed.
- ② Select INSTALL ( $\odot$ ), then press  $\odot$ .
- ③ The INSTALL menu appears.



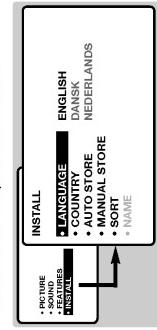
- ④ Using the  $\odot$  key, select SORT then press  $\odot$ . The SORT menu appears. The FROM option is activated.
- ⑤ This menu works as follows:
  - Change "FROM" (enter the current programme number).
  - EXCHANGE numbers" (the operation is carried out).
- ⑥ To exit from the menu, press  $\odot$ .

See also: EasyLink function, page 6.

## Plug & Play

### Choosing a language and country

- ① Press the  $\text{INFO}$  key to display the main menu.
- ② Select INSTALL ( $\odot$ ), then press  $\odot$ .
- ③ The INSTALL menu appears.
- ④ The LANGUAGE option is activated.
- ⑤ Press  $\odot$  to go into the LANGUAGE menu.
- ⑥ Select your language with the  $\circlearrowleft$   $\circlearrowright$  keys.
- ⑦ The menu will appear in the chosen language.
- ⑧ Press  $\odot$  to exit the LANGUAGE menu.
- ⑨ To exit from the menus, press  $\odot$ .

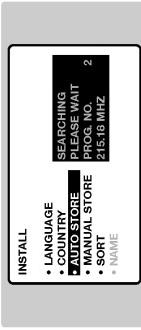


To exit or interrupt the search, press the  $\text{INFO}$  key.  
If no programmes are found, refer to the chapter entitled Tips on p. 16.

- ① If the transmitter or the cable network broadcasts the automatic sort signal, the programmes will be correctly numbered.
- ② If not, the programmes found will be numbered in descending order starting at 99, 98, 97, etc. Use the SORT menu to renumber them.
- ③ Some transmitters or cable networks broadcast their own sort parameters (region, language, etc.). Where this is the case, make your choice using the  $\circlearrowleft$   $\circlearrowright$  keys and confirm with  $\odot$ .
- ④ See also: EasyLink function, page 6.

### Automatic tuning

- ① This menu allows you to automatically search for all the programmes available in your region (or on your cable network).
- ② First carry out operations ① to ⑨ above, then: Press  $\odot$  once to select AUTO STORE, then press  $\odot$ . The search begins. After several minutes, the INSTALL menu reappears automatically.
- ③ If the transmitter or the cable network broadcasts the automatic sort signal, the programmes will be correctly numbered.
- ④ If not, the programmes found will be numbered in descending order starting at 99, 98, 97, etc.
- ⑤ Use the SORT menu to renumber them. Some transmitters or cable networks broadcast their own sort parameters (region, language, etc.). Where this is the case, make your choice using the  $\circlearrowleft$   $\circlearrowright$  keys and confirm with  $\odot$ .
- ⑥ To exit from the menus, press  $\odot$ .



### EasyLink function

(only available on certain versions)

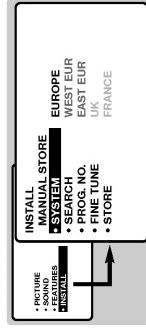
- A message is displayed on-screen during loading. The list of video recorder channels is then the same as those of the set. The LAST LINK setting in the OPTIONS menu must be set to ON (default setting), see page 9.

- ① If the set is connected (by the EXT2 socket) to a video equipped with the EasyLink function, the language, country and channels found are automatically transmitted to the video recorder at the time of installation.

## Manual tuning

This menu allows you to store the programmes one by one.

- ① Press **FEATURES**.
- ② Select **INSTALL (S)**, then press **S**.
- ③ The **INSTALL** menu appears.
- ④ Select **MANUAL STORE (S)** then press **S**.
- ⑤ The menu appears :



- ⑥ Press **S** to go to the **SYSTEM** menu.

Use **S** or **S** to choose EUROPE automatic detection\*) or manual detection with WEST EUR (standard BG reception), EAST EUR (standard DK reception), UK (standard I reception) or FRANCE (standard LL). Then press **S** to exit from the menu.

\* Except for France (standard LL): select the option **FRANCE**.

- ⑤ Select **SEARCH** and press **S**.
- ⑥ The search begins. As soon as a programme is found, the search will stop. If you know the frequency of the programme required, enter its number directly using the **①** to **⑨** keys and go to step ⑦.
- ⑦ If no programme is found, refer to the **Tips chapter** on page 16).

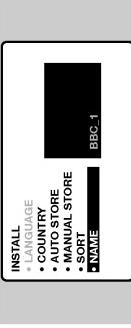
- ⑧ If reception is un-satisfactory, select **FINE TUNE** and hold down **S** or **S** key.
- ⑨ Select **PROG. NO.** (programme number) and use the **S** or **S** to **①** to **⑨** keys to enter the desired number.
- ⑩ Select **STORE** and press **S**. The message **STORED** appears. The programme is stored. See also **Easylink function**, page 6.

- ⑪ Repeat steps ⑥ to ⑩ for each programme to be stored.
- ⑫ To exit: press the **⑨** key.

## Programme name

You may, if you wish, give a name to the first 40 programmes (from 1 to 40).

- ① Press **FEATURES**.
- ② Select **INSTALL (S)**, then press **S**.
- ③ The **INSTALL** menu appears.
- ④ Press **S** 5 times to select **NAMING** (concealed at the bottom of the screen), then press **S**. The menu appears :



- ⑤ Select the programme you wish to name using the keys **①** to **⑨** or **P** (+).
- ⑥ Note: at the time of installation, the programmes are automatically named when the identification signal is transmitted.
- ⑦ Use the keys **S** to move within the name display area (5 characters).
- ⑧ Use keys **S** to choose the characters.
- ⑨ Press **⑨** when the name has been entered. The programme name is stored.
- ⑩ Repeat steps ⑤ to ⑨ for each programme to be named.
- ⑪ To exit from the menus, press **⑨**.

## Using the radio

### Choosing radio mode

Press the **(S)** key on the remote control to switch the TV to radio mode. Press the **(S)** key to return to TV mode. In radio mode the number and name of the station (if available), its frequency and the sound mode are indicated on the screen. To enter the name of the stations use the **NAME** menu. (p. 7)

### Selecting programmes

Use the **①** to **⑨** or **- P** (+) keys to select the FM stations (from 1 to 40).

### List of radio stations

Press the **⑨** key to display / hide the list of radio stations. Then use the cursor to select a station.

## Using in PC monitor mode

### PC Mode

Your TV can be used as a computer monitor. The PIP function lets you display a superimposed image to watch the TV channels at the same time. You must first of all connect the computer and adjust the resolution (see p. 15).

### Choosing PC mode

Press the **(PC)** key on the remote control to switch the TV to PC mode. Press the **(TV)** key to return to TV mode.

If there is no PC signal for more than five seconds, the TV automatically goes into standby mode.

### Using PIP

While in PC mode you can call up a window for TV channels.

- ① Press the **PIP** key to display the PIP screen. The television image is reproduced in a small superimposed window.
- ② Press the **PIP** key again to reduce the size of the window then make it disappear.
- ③ Use the **PIP** key if you want to hide the window. You can also shift it progressively by using the cursor.
- ④ Use the **①** to **⑨** or **- P** (+) keys to change the programmes of the PIP screen or the **⑨** key if you want to display a picture from an appliance connected to the TV (e.g video recorder; DVD).

**Searching radio stations**  
If you have used the quick installation all the new FM stations will be stored. To start a new search use the **INSTALL** menu: **AUTO STORE** (for a complete search) or **MANUAL STORE** (for a station by station search). The **SORT** and **NAME** menus let you classify or name the radio stations. These menus work in exactly the same way as the TV menus.

**Screen saver**

In the **FEATURES** menu you can activate / close the screen saver. The time, the frequency of the station and its name (if available), move across the screen.

### Using the PC menus

Press the **(PC)** key to access the specific settings of the PC monitor mode. Use the cursor to adjust them (the settings are automatically saved) :

• **AUDIO SELECTION**: to choose the sound reproduced on the TV (PC or TV/Radio). For example, you can listen to the radio while you use the computer.

Note: you must choose TV or radio mode before going into PC mode. You cannot listen to the radio when the PIP screen is displayed.

• **BRIGHTNESS / CONTRAST**: to adjust the brightness and contrast.

• **ADJUST COLOUR** : to adjust the colours (cold, normal or warm).

• **VIDEO NOISE**: eliminates the horizontal (PHASE) and vertical (CLOCK) interfering lines.

• **ADJUST POSITION** : to adjust the horizontal and vertical placing of the image.

• **AUTO ADJUST** : position is set automatically.

• **PIP CONTROLS** : to adjust the size and position of the PIP screen.

• **MODE SELECT** : to come back to TV or radio mode.

• **RESET TO FACTORY SETTING** : to return to the factory settings (default settings).

• **VIEW FORMAT** : to choose between large screen or the original format of the PC screens.

## Adjusting the picture

① Press then . The PICTURE menu appears :



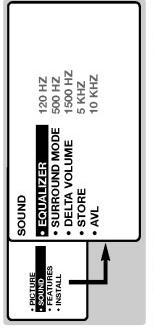
- ④ To exit from the menus, press .
- Description of the settings:**
- BRIGHTNESS: alters the brightness of the image.
  - COLOUR: alters the colour intensity.
  - CONTRAST: alters the variation between light and dark tones.
  - SHARPNESS: alters the crispness of the image.
  - STORE: stores the picture settings.
  - COLOUR TEMP: adjusts the colour temperature of the picture. Three options are available here: COOL (blue white), NORMAL (balanced) or WARM (red white).
  - CONTRAST +: To activate/de-activate the automatic contrast adjustment system (the dark areas are made darker whilst maintaining the detail).

② Use keys to select a setting and keys to adjust.  
*Note:* the menu is a scroll-down menu. Keep the key held down to access the settings hidden at the bottom of the screen.

③ Once the necessary adjustments have been made, select the option STORE and press to store them.

## Adjusting the sound

① Press select the SOUND option () and press . The SOUND menu appears :



- Description of the settings:**
- EQUALIZER: to adjust the sound tone (from bass: 120 Hz to treble: 10 kHz).
  - BALANCE: to balance the sound between the left and right speakers.
  - DELTA VOLUME (volume difference), allows you to compensate for the volume differences between the different programmes or the EXT sockets. This setting is available for programmes 1 - 40 and the EXT sockets. Use the keys to compare the level of different programmes.
  - STORE: stores the sound settings.
  - AVL: automatic volume control used to avoid sudden increases in volume, particularly when changing programmes or during advertisements

② Use keys to select a setting and keys to adjust.  
③ Once the necessary adjustments have been made, select the option STORE and press to store them.

④ To exit from the menus, press .

## Feature settings

- ① Press select FEATURES () and press . You can adjust:
- TIMER, PARENTAL, CONT. and CHILD LOCK : see next page
  - MODE SELECT: to switch the TV in radio, TV or FC mode.
  - EASYLINK (only available on certain versions): If the set is connected (by the EXT2 socket) to

## Timer function

- This menu allows you to use your TV as an alarm clock.
- Press .
  - Select FEATURES () and press twice.
  - The TIMER menu appears :
- 
- Use to set the TV to standby. It will automatically switch on at the time programmed. If you leave the TV switched on, it will only change programme at the time indicated.
  - Press to set the TV to standby. It will automatically switch on at the time programmed. If you leave the TV switched on, it will only change programme at the time indicated.
  - Press to enter and exit the sub-menus and use keys to adjust:
  - TIME: enter current time.  
*Notice:* the time is updated automatically each time the set is switched on using teletext information taken from programme 1. If programme 1 does

## Locking the set

You can bar access to certain programmes or completely lock the set by locking the keys.

### Locking programmes

- Press .
  - Select and press .
  - Select PARENTAL, CONT. () and press .
- 
- To unlock all programmes Repeat stages ① to ④ above, then select CLEAR ALL and press .
  - To change the confidential code Repeat stages ① to ④ above, then:
  - CHOOSE CODE and enter your own 4-digit number.
  - Confirm by entering it again.
  - Press to exit from the menu.
  - If you have forgotten your confidential code, enter the universal code 0711 twice.

### Locking the keys

- Press select CHILD LOCK () and press .
- Select CHILD LOCK () and press to set the lock to ON.
- Switch off the set and put the remote control out of sight. The set cannot be used (it can only be switched on using the remote control).
- To cancel switch CHILD LOCK to OFF.

## Teletext

Teletext is an information system broadcast by certain channels which can be consulted like a newspaper. It also offers access to subtitles for viewers with hearing problems or who are not familiar with the transmission language (cable networks, satellite channels, etc.).

### Press :

**Teletext call**

This is used to call teletext, change to transparent mode and then exit. The summary appears with a list of items that can be accessed. Each item has a corresponding 3 digit page number. If the channel selected does not broadcast teletext, the indication "100 will be displayed and the screen will remain blank [in this case, exit teletext and select another channel].

**Selecting a page**

Enter the number of the page required using the **(0)** to **(9)** or **(- P +)** keys. Example: page 120 enter **(1)** **(2)** **(0)**. The number is displayed top left, the counter turns and then the page is displayed. Repeat this operation to view another page.

If the counter continues to search, this means that the page is not transmitted. Select another number.

**Direct access to the items**

The 4 coloured keys are used to access the items or corresponding pages. The coloured areas flash when the item or the page is not yet available.

**Contents**

This returns you to the contents page (usually page "100").

**Direct selection of sub-pages**

Certain pages contain sub-pages (for example, page 120 contains sub-pages 1/3, 2/3 and 3/3). If this is the case, the page number is displayed in green, preceded by the symbol **▼**, **▲** or **►**. Use the keys **(C)** **(D)** to directly access the sub-pages of your choice.

**Enlarge a page**

This allows you to display the top or bottom part of the page and then return to normal size.

**Double page teletext**

To activate or deactivate the double page teletext display mode. The active page is displayed on the left and the following page is displayed on the right. Press **(B)** if you want to hold a page (i.e. the contents page). The active page is then displayed on the right. To return to normal mode, press **(H)**.

**Hidden information**

To display or hide the concealed information (games solutions).

**Favourite pages**

Instead of the standard coloured areas displayed at the bottom of the screen, you can store 4 favourite pages on the first 40 channels which can then be accessed using the coloured keys (red, green, yellow, blue). Once set, these favourite pages will become the default every time teletext is selected.

**Press the **(B)** key** to change to favourite pages mode.

**Display the teletext page that you want to store.**

**Press **(B)** then the coloured key of your choice.** The page is stored.

**Repeat steps **2** and **3** for the other coloured keys.**

**Now when you consult teletext, your favourite pages will appear in colour at the bottom of the screen.**

**To temporarily retrieve the standard items, press **(H)**.**

**To clear everything and return the standard items as the default, press **(B)** for 5 seconds.**

## 16:9 Formats

The pictures you receive may be transmitted in 16:9 format (wide screen) or 4:3 format (conventional screen). 4:3 pictures sometimes have a black band at the top and bottom of the screen (letterbox format). This function allows you to optimise the picture display on screen.

### If your television is equipped with a 4:3 screen.

**Press the **(B)** key (or **(C)** **(D)**) to select the different modes:**



**EXPAND 4:3**

The picture is enlarged vertically. This mode is used to cancel the black bands when watching a programme in letterbox format.



**COMPRESS 16:9**

The picture is compressed vertically into 16:9 format.

### If your television is equipped with a 16:9 screen.

**Press the **(B)** key (or **(C)** **(D)**) to select the different modes:**

*This TV set is also equipped with automatic switching which will select the correct-screen format, provided the specific signals are transmitted with the programmes.*

**4:3**

The picture is reproduced in 4:3 format and a black band is displayed on either side of the picture.

**ZOOM 14:9**

The picture is enlarged to 14:9 format, a thin black band remains on both sides of the picture.

**ZOOM 16:9**

The picture is enlarged to 16:9 format. This mode is recommended when displaying pictures which have black bands at the top and bottom (letterbox format).

**SUBTITLE ZOOM**

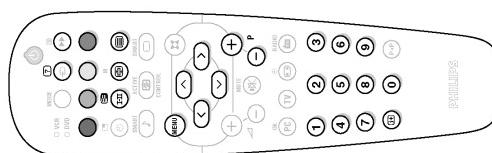
This mode is used to display 4:3 pictures using the full surface of the screen leaving the sub-titles visible.

**SUPER WIDE**

This mode restores the correct proportions of images transmitted in 16:9. Note: if you display a 4:3 picture in this mode, it will be enlarged horizontally.

**FULL SCREEN**

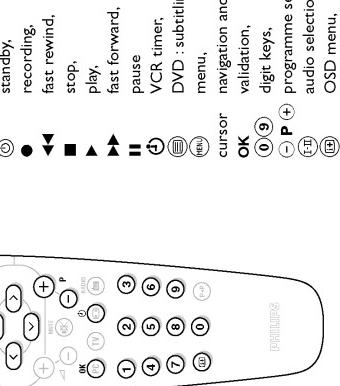
This mode displays images in full screen.



## Video recorder or DVD keys

Most of the audio and video equipment from our range of products can be operated with the remote control of the TV.  
The remote control is compatible with all video recorders using the RC5 standard and all DVDs using the RC6 standard.

- ① Press the **MODE** key to select the required mode: **VCR** (video recorder) or **DVD**. The remote control indicator lights up to display the selected mode. It switches off automatically after 20 seconds if left idle. The remote control automatically returns to TV mode.
- ② The following keys are operational, depending on the equipment :



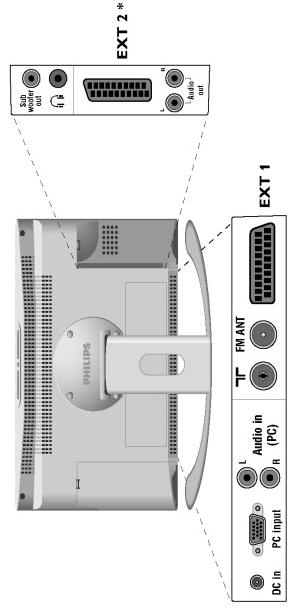
## Connecting peripheral equipment

Depending on the version the TV is equipped with one or two EXT1 and EXT2 sockets.

A special adaptor is supplied to connect to EXT1 and can route the leads to the back.

The EXT1 socket has audio, CVBS/RGB inputs and audio, CVBS outputs.

The EXT2 socket (if available) has audio, CVBS/S-VHS inputs and audio, CVBS outputs.



### Video recorder

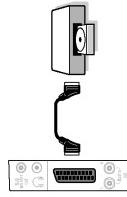
#### Video recorder (or DVD recorder)

Carry out the connections shown opposite, using a good quality euroconnector cable. If your video recorder has the Easylink function, use the EXT2 socket. If your video recorder does not have a euroconnector socket, the only connection possible is the aerial cable. You will therefore need to tune in your video recorder's test signal and assign it programme number 0 (refer to manual store, p. 6).

#### Video recorder with decoder

Connect the decoder to the second euroconnector socket of the video recorder. You will then be able to record scrambled transmissions.

### Other equipment



## Glossary

**EasyLink:** Digital link between the set and the video recorder which allows a direct transfer of certain information such as channel setting or programming.

**PIP** (Picture in Picture): Superimposed window that displays a small picture in the main picture. In PC mode you can display an image from the TV or other appliance (e.g. DVD or video recorder) in a small window.

**RGB** signals : These are the three video signals, Red Green Blue, which make up the picture.

Using these signals improves picture quality.

**S-VHS signals** : There are 2 separate Y/C video signals from the S-VHS and Hi-8 recording standards. The luminance signals Y (black and white) and chrominance signals C (colour) are recorded separately on the tape. This provides better picture quality than with standard video (VHS and 8 mm) where the Y/C signals are combined to provide only one video signal.

**NICAM sound** : Process by which digital sound can be transmitted.

**System** : Television pictures are not broadcast in the same way in all countries. There are different standards: BG, DI, I, and L; The SYSTEM setting (p. 6) is used to select these different standards. This is not to be confused with PAL or SECAM colour coding. Pal is used in the majority of European countries, Secam in France, the CIS and the majority of African countries.

The United States and Japan use a different system called NTSC. The inputs EXT1 and EXT2 are used to read NTSC-coded recordings.

**16:9** : Refers to the ratio between the length and height of the screen.

Wide screen televisions have a ration of 16:9, conventional screen TV sets have a ration of 4:3.

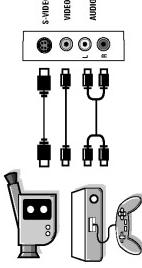
### To select connected equipment

Press the **(TV)** key to select EXT1 and on the versions with 2 starts, EXT2, S-VHS2 (S-VHS signals from the EXT2 socket) and EXT3. Most equipment (decoder, video recorder) carries out the switching itself.

**Camcorder, video games**

The **AV** and **S-VIDEO** connections are located under the left panel or for large screen sizes, under the right panel. Make the connections as shown opposite. With the **(F)** key, select **EXT3**.

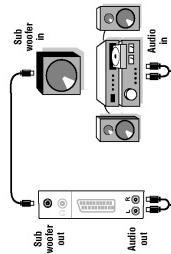
For a monophonic device, connect the audio signal to the **AUDIO L input**. The sound automatically comes out of the left and right speakers of the set.

**Headphones**

When headphones are connected, the sound on the TV set will be cut. The **(- P +)** keys are used to adjust the volume level. The headphone impedance must be between 32 and 600 Ohms.

**Amplifier**

To connect a Hi-Fi unit use an audio connection cord and connect the **L** and **R Audio out** of the TV to an **Audio in L** and **R** from the Hi-Fi unit. If you have an active speaker connect the **Subwoofer out** of the TV to the **Subwoofer in** of the speaker.

**Computer**

Connect the monitor output of your computer to the **PC Input (VGA)** of the TV. Connect the sound output **Audio out L and R** of the computer to the input **Audio in (PC) L and R of the TV**. For more information on using PC mode see page 8.

Configure the computer on  $1280 \times 1024, 60$  Hz for optimum resolution.

**Attention:** If you use another resolution, the PIP function may not work. In this case a warning message is displayed on the screen. Here is the list of the different display resolutions available on your TV:

$640 \times 350, 70$ Hz	$720 \times 400, 70$ Hz	$1024 \times 768, 60$ Hz
$640 \times 350, 85$ Hz	$720 \times 400, 85$ Hz	$1024 \times 768, 70$ Hz
$640 \times 480, 60$ Hz	$800 \times 600, 56$ Hz	$1024 \times 768, 75$ Hz
$640 \times 480, 67$ Hz	$800 \times 600, 60$ Hz	$1024 \times 768, 85$ Hz
$640 \times 480, 72$ Hz	$800 \times 600, 72$ Hz	$1152 \times 864, 75$ Hz
$640 \times 480, 75$ Hz	$800 \times 600, 75$ Hz	$1280 \times 960, 60$ Hz
$640 \times 480, 85$ Hz	$800 \times 600, 85$ Hz	$1280 \times 1024, 60$ Hz
$832 \times 640, 75$ Hz		$1280 \times 1024, 75$ Hz

**Tips**

<b>Poor reception</b>	The proximity of mountains or high buildings may be responsible for ghost pictures, echoing or shadows. In this case, try manually adjusting your picture; see "fine tuning" (p. 7) or modify the orientation of the outside aerial. Does your antenna enable you to receive broadcasts in this frequency range (UHF or VHF band)?
<b>No picture</b>	Have you connected the aerial socket properly? Have you chosen the right system? (p. 7). Poorly connected euroconnector cables or aerial sockets are often the cause of picture or sound problems (sometimes the connectors can become half disconnected if the TV set is moved or turned). Check all connections.
<b>Peripheral equipment gives a black and white picture</b>	You have not selected the right socket with the <b>(F)</b> key. S-VHS2 instead of EX72. To play a video cassette, check that it has been recorded under the same standard (PAL, SECAM, NTSC) which can be replayed by the video recorder.
<b>No sound</b>	If on certain channels you receive a picture but no sound, this means that you do not have the correct TV system. Modify the SYSTEM setting (p. 7). The amplifier connected to the TV does not deliver any sound? Check that you have not confused the audio output with the audio input.
<b>PC and PIP modes don't work?</b>	Check that you have configured the computer on a compatible display resolution (see p. 15). You can't get the radio sound in PC mode? When PIP is active the sound is forced to TV. You must de-activate PIP, go into radio mode and then come back to PC mode.
<b>Remote control</b>	The TV set does not react to the remote control; the indicator on the set no longer flashes when you use the remote control? Replace the batteries.
<b>Standby</b>	When you switch the TV set on it remains in standby mode and the indication LOCKED is displayed when you use the keys on the TV set? The CHILD LOCK function is switched on (p. 10). If the set receives no signal for 15 mins, it automatically goes into standby mode. To save power, your set is fitted with components that give it a very low power consumption when in standby mode (less than 1W).
<b>Cleaning the set</b>	Only use a clean soft and lint-free cloth to clean the screen and the casing of your set. Do not use alcohol-based or solvent-based products.
<b>Still no results?</b>	Disconnect the mains plug of the TV for 30 seconds then reconnect it. If your TV set breaks down, never attempt to repair it yourself contact your dealer's after-sales service.

English      Eesti      Italiano      Deutsch      Français      Nederlandse

LCD-3111 256 1420.1

## 4. Mechanical Instructions

### Index of this chapter:

1. Service Position
2. Stand Removal
3. Rear Cover Removal
4. Shield Removal
5. Side I/O Removal
6. LED/Remote Control Board Removal
7. TV Board Removal
8. Scaler Board Removal
9. Inverter Board Removal
10. Top Control Assy Removal
11. LCD Panel Removal
12. Re-assembly

**Note:** Figures below can deviate from the actual situation, due to different set executions.

### 4.1 Service Position

First, put the TV in its service position. Therefore place it upside down on a tabletop (use a protection sheet or a foam cushion). Take care that this is flat and free from obstacles like screws, to prevent damaging the fragile LCD screen.

### 4.2 Stand Removal

Use a Torx screwdriver to remove the stand from the backside of the monitor housing by unscrewing and removing the four M4x12 mounting screws and next, take away the stand.

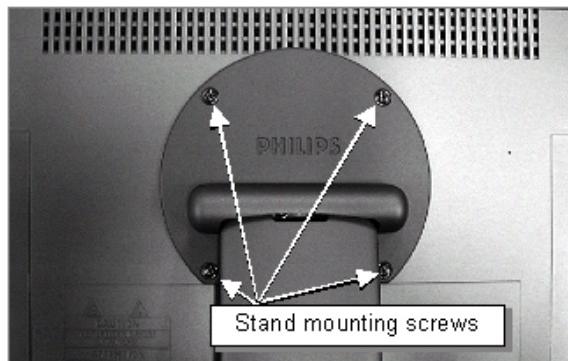


Figure 4-1 TV stand removal

### 4.3 Rear Cover Removal

1. Manually unlock and remove both corner cover caps.

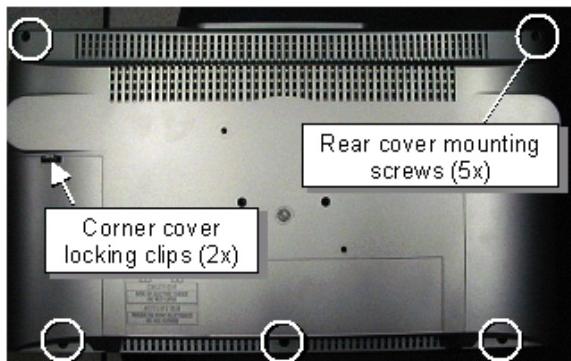


Figure 4-2 TV rear cover removal

1. Make sure all power-, audio-, video-, coax-, and SCART cables are unplugged.
2. Remove the five Torx screws securing the monitor rear cover.
3. Carefully remove the rear cover and store it on a safe place.

### 4.4 Shield Removal

1. Remove at the "SCART plug side" the screw besides the plug.
2. Remove the connector plate.

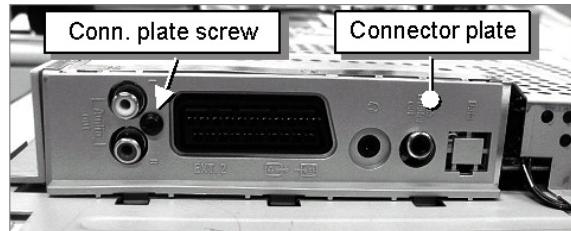


Figure 4-3 TV SCART plug side

1. Unscrew, at the bottom side, the connector plate screw and remove this plate.

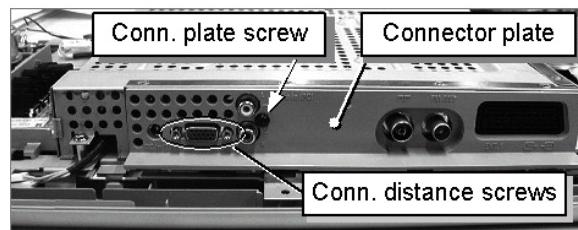


Figure 4-4 TV bottom side connector plate.

1. Use a 5 mm socket screwdriver to remove both connector distance bolts from the "PC input / VGA-in" socket.
2. Remove the six shield mounting screws.

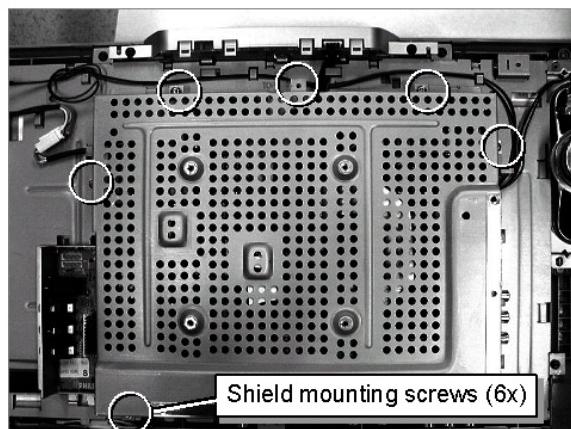
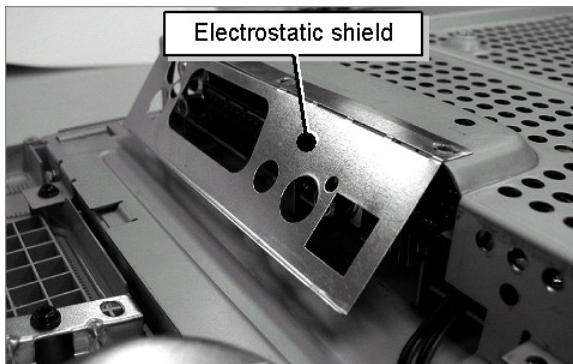


Figure 4-5 Shield with mounting screws

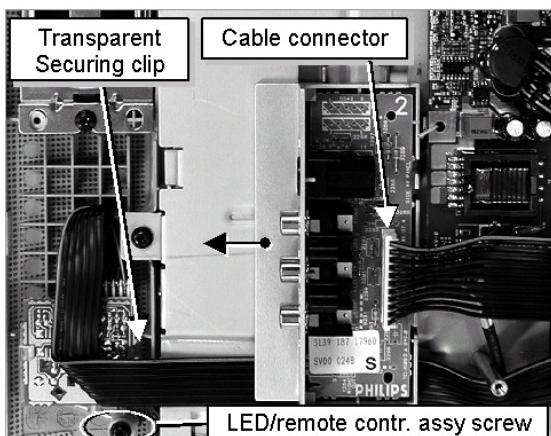
1. Bend at the "SCART-plug side" the thin metal electrostatic shield away from the sockets, so the complete shield can be lifted later on.



**Figure 4-6 Shielding**

- Carefully move the complete shield a few millimetres to the bottom side so that the topside will detach from underneath the two lock clamps, which secure the shield at topside. Carefully lift the shield with respect for the cables and/or connector sockets. Take out the shield and store it on a safe place.

#### 4.5 Side I/O Removal



**Figure 4-7 Side IO assy removal**

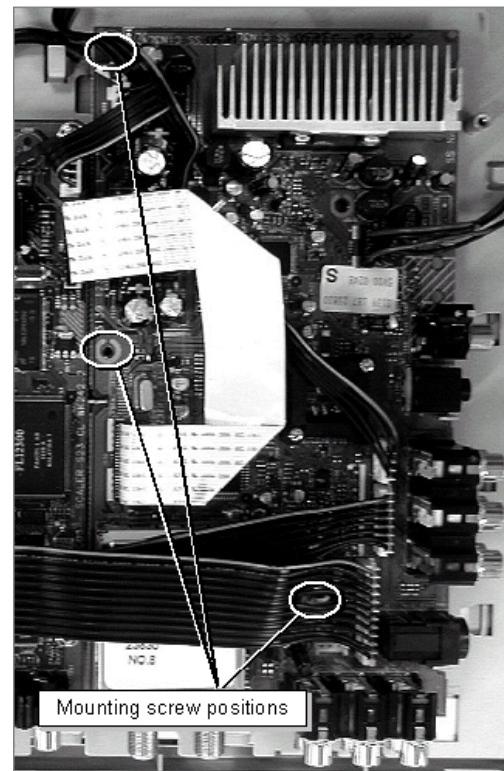
- Disconnect the cable connector of the Side I/O assy (0240).
- Unlock this unit by shifting it one centimetre to the outside direction of the monitor.
- Take out this Side IO assy.

#### 4.6 LED/Remote Control Board Removal

- Unlock the transparent securing clip, which holds the PWB in place, and take out the LED/Remote control PWB. (See previous figure: "Side IO assey removal").
- To completely remove the Led/Remote control assy (incl. Lens), remove the assy screw.

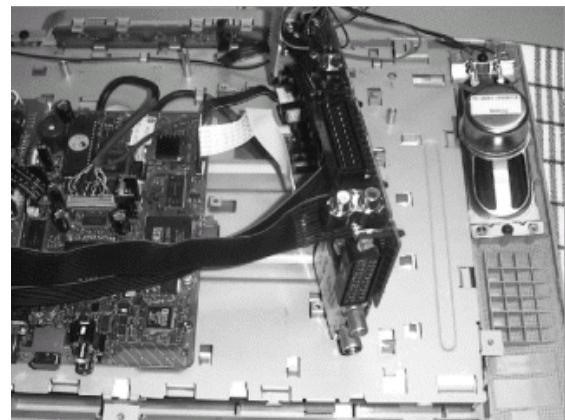
#### 4.7 TV Board Removal

- Disconnect all five PWB connectors out of the regarding sockets 3225, 1234, 1231, 1902, and 1732.
- Pull the thin flat cable out of its special shaped connector, 1010.
- Unscrew and remove the three PWB mounting screws.
- Take out the TV board.



**Figure 4-8 TV board**

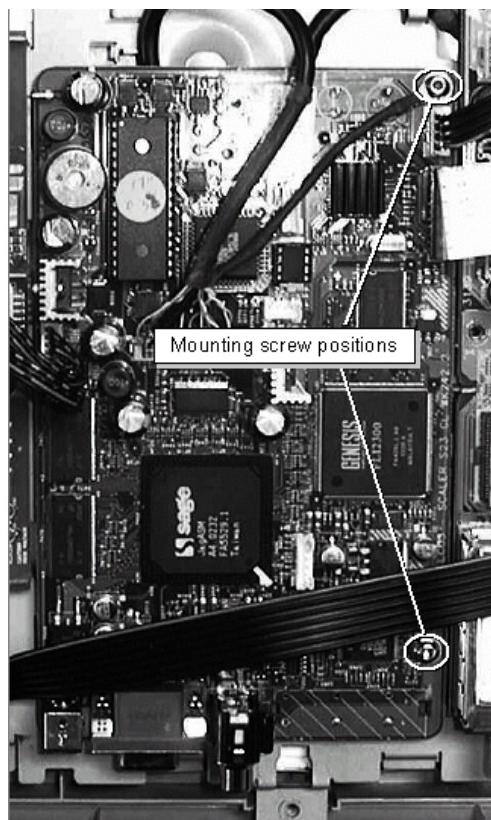
**Note:** Sometimes it is necessary to place the TV board in its service position, for easy signal measuring. See picture below.



**Figure 4-9 TV board in service position**

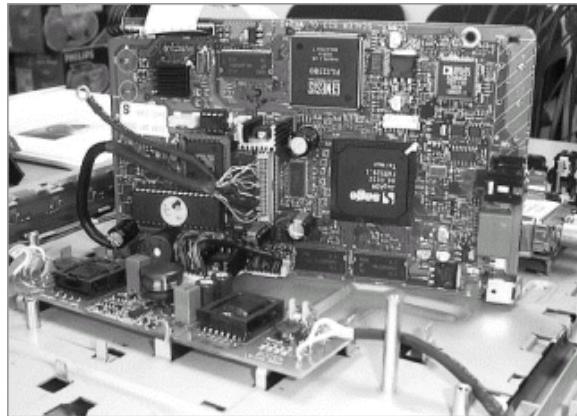
#### 4.8 Scaler Board Removal

- Carefully disconnect the cable connector in the centre of the board (1506). Take care not to damage the fragile cables.
- Disconnect the cable connectors at the edge of the board (1402 and 1003).
- Pull the thin flat cable out of its special shaped connector (1681).
- Unscrew and remove both nickel-plated PWB mounting screws.
- Take out the Scaler PWB.



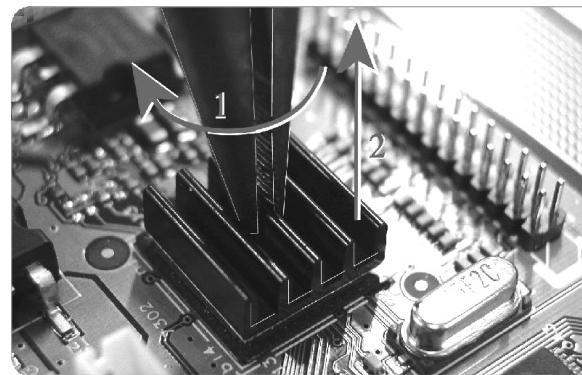
**Figure 4-10 Scaler PWB**

**Note:** Sometimes it is necessary to place the SCALER board in its service position. In this case it is necessary to use the specific "Repair kit scaler board" including two extra long cables (order nr. 3122 785 90490).



**Figure 4-11 Scaler PWB in service position**

**Important:** Video converter chip heat sink.

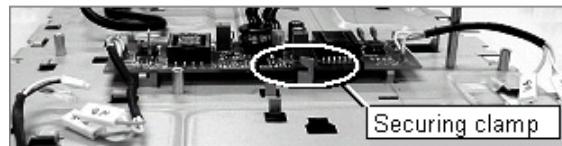


**Figure 4-12 Heat Sink removed**

1. Use a pair of pliers to take off the heat sink by means of a twist- and pull movement (see figure), before you de-solder the video converter chip SAA7118 from the board. Store the heat sink on a safe place, adhesive side up!
2. Place the self adhesive heat sink back in place after the chip exchange action has been finished.

#### 4.9 Inverter Board Removal (only for 15" and 17")

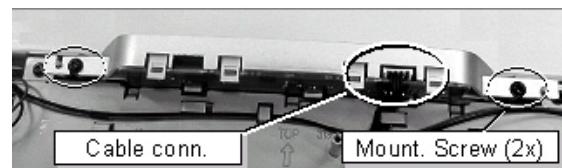
1. Disconnect the cable from the PWB.
2. Disconnect at top and bottom side both black/white and pink cable connectors.
3. Use a pair of pliers to bend the metal securing clamp in such a way that the PWB can be taken out.
4. Remove the Inverter PWB and store it on a safe place.



**Figure 4-13 Inverter PWB**

#### 4.10 Top Control Assy Removal

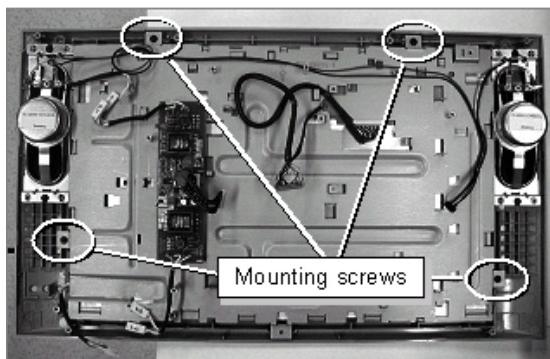
1. Remove the cable from the Top control assy (1500).
2. Remove both mounting screws that secure the unit to the monitor frame.
3. Take out the Top control assy.



**Figure 4-14 Top control assy**

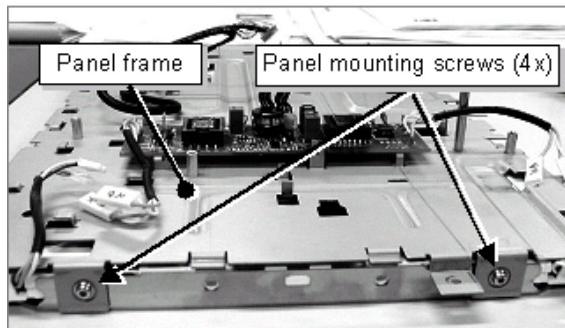
#### 4.11 LCD Panel Removal

1. Unscrew and remove the four panel frame mounting screws, which secure the panel frame to the monitor front.
2. Disconnect at both sides the speaker cable plugs and remove the speaker cable assy.
3. Take out the LCD panel (including its frame).



**Figure 4-15 LCD panel frame screws**

1. Remove the plastic monitor front from the protection sheet and place the LCD panel, including the panel frame, back on the protection sheet or foam cushion. Make sure again that there are no screws or other parts left behind on the protection sheet, that can damage the fragile panel screen surface.
2. Unscrew the four screws, securing the panel frame to the LCD panel (see figure: "LCD panel with mounting screws").



**Figure 4-16 LCD panel with mounting screws**

1. Take off the panel frame while leading the panel connector through the access hole in the frame.

#### 4.12 Re-assembly

To re-assemble the whole set, do all processes in reverse order.

##### Notes:

- When you secure the panel frame (with the LCD panel) in the monitor front, do **not** mount the fifth screw in the middle of the bottom side. You will need this screw position for mounting the TV rear cover.
- Take extra care when fixing the connector bracket screw at SCART plug side. You can easily damage the TV board when you use too much force.
- Do **not** forget to re-place the ground cable of the Scaler board when mounting the screw at topside.
- Take extra care when reconnecting the inverter PWB backlight connectors (black/white/pink). Connect them properly to avoid "high voltage sparking".

## 5. Service Modes, Error Messages, and Repair Tips

Index of this chapter:

1. Test Points
2. Service Modes
3. Errors
4. The "Blinking LED" Procedure
5. Trouble Shooting Tips

### 5.1 Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or Ixxx. On the PCB, test points are specifically mentioned in the service manual as "half moons" with a dot in the centre.

Measurements are performed under the following conditions:

- Video: colour bar signal.
- Audio: 3kHz left, 1kHz right.

### 5.2 Service Modes

#### 5.2.1 Limited DST Support

This chassis does still have some limited Dealer Service Tool (DST) support. The set can be put in two service modes via the DST (RC7150). These are the Service Default Mode (SDM) and the Service Alignment Mode (SAM).

##### **Installation Features Dealer**

For easy installation and diagnosis the DTS can be used. When there is no picture (to access the error code buffer via the OSD), DST can enable the functionality of displaying the contents of the entire error code buffer via the blinking LED procedure.

The dealer can use the RC7150 for programming the TV-set with presets. Ten different program tables can be programmed into the DST via a GFL or MG TV-set (downloading from the GFL or MG to the DST; see GFL or MG service manuals) or by the DST-I. For explanation of the installation features of the DST, the directions for use of the DST are recommended.

#### 5.2.2 Service Default Mode (SDM)

##### **Purpose of SDM:**

- To provide a situation with predefined settings to get the same measurements as in this manual.
- To start the "Blinking LED" procedure.
- To have the possibility to override the 5V protection

##### **Activating SDM:**

- By transmitting the "DEFAULT" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SAM).
- Standard RC sequence 0-6-2-5-9-6 followed by pressing the "MENU"-button (this works both while the set is in normal operation mode or in the SAM).
- By shorting pins 5 and 6 of connector 1170 of LED/RC panel. Then apply DC supply from the AC-DC adaptor (not required to remove the metal shielding).

**Note:** By temporarily shorting pins 5 and 6 of connector 1170 and then applying DC supply from the AC-DC adaptor, the 5V protection is disabled.

**Caution:** Overriding the 5V protection should only be used for a short period of time. In case of S/W protections (error 4) the set will shutdown after 15 sec.

For recognition, "SDM" is displayed at the upper right corner of the screen.

##### **SDM Menu**

S D M									
T Y P E : 1 7 P F 9 9 4 5 / 0 1 2					H R S : 0 0 2 9				
S W I D : L C 0 3 E 2 1 - 1 . 1 1					S 3 1 7 1 . 0 3				
E R R : 0 0 0 0 0					O P T : 7 9 2 5 4 1 4 5 6 1 2 8 0 0 0				

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**Figure 5-1 SDM Menu**

##### **Deactivating SDM:**

- Press the "EXIT"-button on the DST, or
- Press 0-0 on the standard RC, or
- Switch the set to Standby (the error buffer is NOT cleared).

**Note:** When the mains power is switched off while the set is in SDM, the set will switch to SDM immediately when the mains is switched on again.

The SDM sets the following pre-defined conditions:

- PAL/SECAM sets: tuning at 475.25 MHz PAL.
- NTSC sets: tuning at channel 3 (61.25 MHz).
- Volume level is set to 25% (of the maximum volume level). Other picture and sound settings are set to 50%.

The following functions are switched off in SDM (and after leaving SDM):

- Timer.
- Sleep timer.

The following functions are disabled during SDM (and enabled after leaving SDM)

- Parental lock.
- Blue mute.
- Hospitality Mode.
- No-ident Timer (normally the set is automatically switched off when no video signal (IDENT) was received for 15 minutes).

All other controls operate normally.

##### **Special Functions SDM**

###### *Access to normal user menu*

Pressing the "MENU" button on the remote control switches between the SDM and the normal user menus (with the SDM mode still active in the background).

###### *Channel search*

Pressing the "P+" button of the remote control will select the next available channel in the preset list.

###### *Type nr, Error buffer, etc*

Pressing the "OSD" or "info+" button of the remote control shows/hides the type nr, error buffer, SW ID, Hours and option codes. OSD can be hidden to prevent interference with waveform measurements.

###### *Access to SAM*

By pressing 0-6-2-5-9-6 "info+" (or OSD) in sequence on the standard RC will switch from SDM to SAM.

### 5.2.3 Service Alignment Mode (SAM)

#### Purpose of SAM:

- To do alignments.
- To change option settings.
- To display/clear the error code buffer values.

#### Activating SAM:

- By transmitting the "ALIGN" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SDM).
- Standard RC sequence 0-6-2-5-9-6 followed by pressing the "info+"-button (this works both while the set is in normal operation mode or in the SDM).

#### Deactivating SAM:

- Press the "EXIT"-button on the DST, or
- Press 0-0 on the standard RC, or
- Switch the set to Standby (the error buffer is NOT cleared).

**Note:** When the AC-DC adaptor power is switched off while the set is in SAM, the set will go back to normal mode of operation when the AC-DC adaptor is switched on again.

In SAM the following information is displayed on the screen:

#### SAM Menu

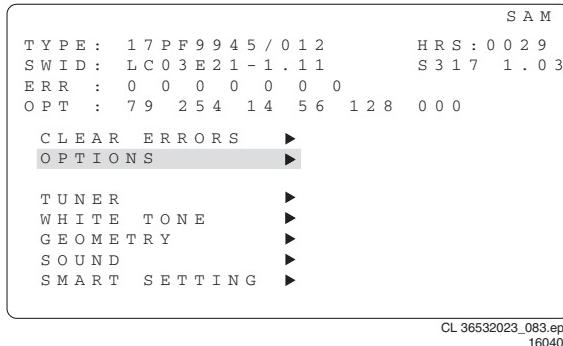


Figure 5-2 SAM Menu

- Operation hours timer (hexadecimal).
- Software identification of the main micro controller of TV-board (LC03BBC-X.YY), and (S3DD E.FF) is the software identification for micro-P of Scaler board:
  - LC03 is the chassis name for LCD-TV launched in 2003.
  - BBC is 1 letter and 2 digit combination to indicate the regional software type and the supported languages.
  - X = main version number.
  - YY= subversion number.
  - S3 = Scalar board used in 2003.
  - DD = screen size of the LCD panel.
  - E = main version number.
  - FF = subversion number.
- Error buffer (7 errors possible).
- Option bytes (8 codes possible), summary of options are explained below.
- Sub menus are listed in a scroll-menu.

#### SAM Menu Control

Menu items can be selected with the cursor UP/DOWN key. The selected item will be highlighted. When not all menu items fit on the screen, moving the cursor UP/DOWN will display the next/previous menu items.

With the cursor LEFT "< / RIGHT ">" keys, it is possible to:

- Activate the selected menu item (e.g. GEOMETRY).
- Change the value of the selected menu item (e.g. HOR.SHIFT).
- Activate the selected submenu (e.g. ASBY ON/OFF).

- To return to the main menu / previous menu, press "MENU" keys on the remote control

#### Access to Normal User Menu

Pressing the "MENU" button on the remote control switches between the SAM and the normal user menus (with the SAM mode still active in the background). Pressing the "MENU" key in a submenu will go to the previous menu.

#### Menus and Submenus

**CLEAR ERRORS:** Erasing the contents of the error buffer. Select the CLEAR ERRORS menu item and press the MENU RIGHT key. The content of the error buffer is cleared.

The functionality of the OPTIONS and ALIGNMENTS (TUNER, WHITE TONE, GEOMETRY, SOUND and SMART SETTING) sub menus are described in chapter 8.

### 5.2.4 Customer Service Mode (CSM)

This chassis is equipped with the "Customer Service Mode" (CSM, like in the A10-chassis). CSM is a special service mode that can be activated and deactivated by the customer, upon request of the service technician/dealer during a telephone conversation in order to identify the status of the set. This CSM is a 'read only' mode therefore modifications in this mode are not possible.

#### Activating Customer Service Mode.

The Customer Service Mode can be switched on:

- By pressing RC button in sequence "1-2-3-6-5-4" or,
- By pressing simultaneously the MUTE button on the remote control and any key on the TV control buttons (P+, P-, VOL +, VOL -) for at least 4 seconds.

When the CSM is activated:

- Picture and sound settings are set to nominal levels.
- Modes that interfere with the behaviour of the set are switched off (sleep timer, auto standby, etc.).
- Pressing cursor DOWN "v" on the RC will switch to CSM2 screen if it is in CSM1 screen. Likewise pressing cursor UP "^" will switch to previous CSM1 screen.
- Pressing "P+" or "P-" on RC will select next available channel to be displayed.
- Pressing channel numeric keys on RC will select the desired channel to be displayed.

#### Deactivating Customer Service Mode.

The Customer Service Mode will be switched off after:

- Pressing any key on the remote control handset (except "P+", "P-", and cursor up/down)
- Switching off the TV set with the mains switch.

All settings that were changed during activation of CSM are restored to the initial values.

#### Customer Service Mode Information Screen

After activating the Customer Service Mode the following screen will appear.

```

1 TYPE : 17PF9945 / 012 HRS : 0029 CSM1
2 SWID : LC03E21-1.11 S317 1.03
3 ERR : 0 0 0 0 0 0
4 OPT : 79 254 14 56 128 000
5
6 SYSTEM: WEST EUR 11 SOURCE : 5
7 NO SIGNAL 12 SOUND : MONO
8 TIMER ON 13 VOLUME : 26
9 CHANNEL BLOCKED 14 BALANCE: 1
10 NOT PREFERRED 15 COLOUR : 50

```

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**Figure 5-3 CSM 1**

The Customer Service Menu (CSM1) shows the following information:

- Line 1: "TYPE: 99XX9999/99XHRS: nnnn". TYPE: type-version/model of the set (i.e. 17PF9945/12). HRS: Hexadecimal counter of operating hours. (Standby hours are counted as operating hours).
- Line 2: "SWID: AAAABC-X.YYS3DDE.FF". SWID: (Software identification of the main micro controller on TV-Board and Scaler board) See paragraph "Service Alignment Mode (SAM)". Details on available software versions can be found in the chapter "Software Survey" of the publication "Product Survey - Colour Television".
- Line 3: "CODES: xx xx xx xx xx xx xx". Error code buffer (see paragraph "Errors"). Displays the last 7 errors of the error code buffer.
- Line 4: "OPT xxx xxx xxx xxx xxx xxx xxx xxx". Option bytes. Option bits control the software and hardware functionality of the chassis. An option byte or option number represents 8 of those bits. Each option number is displayed as a decimal number between 0 and 255. The set may not work correctly when an incorrect option code is set. See chapter 8 for more information on correct option settings
- Line 6: "SYSTEM: EUROPE/WEST EUR/EAST EUR/UK/FRANCE". Indicates which colour and sound system is installed for this preset as defined in the Manual INSTALL menu:
  - PAL BG
  - PAL I
  - PAL DK
  - SECAM BG
  - SECAM DK
  - SECAM LL'
- Line 7: "NO SIGNAL". Indicates that the set is not receiving an "ident" signal on the selected source.
  - No or bad antenna signal; connect a proper antenna signal
  - Antenna not connected; connect the antenna
  - No channel / preset is stored at this program number; go to the INSTALL menu and store a proper channel at this program number
  - The tuner is faulty (in this case the CODES line will contain number 13); check the tuner and replace/repair if necessary

**Note:** On some models, BLUE MUTE is displayed (if the BM option is ON) when no signal is received.

- Line 8: "TIMER ON". Indicates that the sleep timer is activated. Complaints that may be caused by the activation of the sleep timer.
- Line 9: "CHANNEL BLOCKED". Indicates that one or more channels are locked except the selected channel. Complaints that may be caused by locked channels:
  - TV cannot be switched on from standby with the local keyboard buttons
  - "P+" and "P-" buttons on local keyboard do not function

To disable the LOCK feature:

1. Select "FEATURE" menu (with the Remote Control)

## 2. Select "LOCK" (with the RC)

### 3. Set to "OFF"

- Line 10: "NOT PREFERRED". Indicates that the current channel is not in the preferred channel list (by default, all channels are skipped). A channel can be added as a selected channel to the list of preferred channels:
  1. Select "INSTALL" menu
  2. Select "CHANNEL EDIT"
  3. Select "ADD/DELETE"
  4. Set to "ADD" with the left/right cursor keys
- Line 11: "SOURCE". Indicates which SOURCE is installed for this preset: EXT1, SVHS2, EXT2, or Tuner.
- Line 12: "SOUND". Indicates which sound mode is installed for this preset: Mono, NICAM, Stereo, L1, L2, SAP, Virtual, or Digital.
- Line 13: "VOLUME". Value indicates level at entry CSM.
- Line 14: "BALANCE". Value indicates level at entry CSM.
- Line 15: "COLOUR". Value indicates level at entry CSM.

```

1 TYPE : 17PF9945 / 012 HRS : 0029 CSM2
2 SWID : LC03E21-1.11 S317 1.03
3 ERR : 0 0 0 0 0 0
4 OPT : 79 254 14 56 128 000
5
6 BRIGHTNESS: 50 11
7 CONTRAST : 56 12
8 HUE : 50 13
9 : 50 14
10 : 50 15

```

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**Figure 5-4 CSM 2**

The next Customer Service Menu (CSM2) shows the following information:

- Line 6: "BRIGHTNESS". Value indicates level at entry CSM.
- Line 7: "CONTRAST". Value indicates level at entry CSM.
- Line 8: "HUE". Value indicates level at entry CSM.
- Line 9: "HOTEL MODE ON". Indicates that the Hotel mode has been activated.

## 5.3 Errors

### 5.3.1 Error code buffer

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, the error is written at the left side and all other errors shift one position to the right.

The error code buffer will be cleared in the following cases:

- By activating the CLEAR ERRORS function in SAM menu.
- By transmitting 0-6-2-5-9-9 with the normal RC.
- By transmitting the commands "DIAGNOSE 99 OK" with the DST (RC7150) or with ComPair.
- Automatically reset if its contents has not changed for 50 hours.

By leaving SDM or SAM with the mains switch, the error buffer is not reset.

Examples:

ERROR: 0 0 0 0 0 0 : No errors detected

ERROR: 6 0 0 0 0 0 : Error code 6 is the last and only detected error

ERROR: 9 6 0 0 0 0 : Error code 6 was first detected and error code 9 is the last detected (newest) error

The contents of the error buffer can also be made visible through the "blinking LED" procedure. This is especially useful when there is no picture. See paragraph 5.4 "The blinking LED procedure".

### 5.3.2 Error codes

In case of non-intermittent faults, clear the error buffer before starting the repair, to prevent that "old" error codes are present (it is wise to write down the content of the error buffer before you clear it). If possible check the entire content of the error buffers. In some situations an error code is only the result of another error code (and not the actual cause).

**Note:** a fault in the protection detection circuitry can also lead to a protection.

**Table 5-1 Error codes**

Error code	Error description	Possible defective components	Diagram
0	No error detected	-	----
1-3	Reserved		
4	5V protection active	IC7930 or +5V I2C devices	A3, A8, A10
5	Reserved		
6	General I2C bus error	I2C bus s/c or o/c	
7	Reserved		
8	BOCMA I2C error	IC 7301	A4
9	BOCMA 8V supply failure	IC 7910 or IC7301	A4, A10
10	NVM I2C error	IC 7066	A1
11	NVM identification failure	IC 7066	A1
12	uProcessor internal RAM test failure	IC 7064	A1
13	Tuner I2C error	IC 1100 - UR13xx	A3
14	Sound processor I2C error	IC 7620 (MSP34xx)	A8
15	SRAM I2C error	IC 7070	A2
16	Reserved		
17#	3D CF processor I2C error	IC 7823	B
18-20	Reserved		
21	Scaler protection active	IC 7402	C4
22	Scaler protection active	IC 7351	C9
23	Scaler protection active	IC 7302	C3
24*	HDTV decoder I2C error	IC 7252	C10
25	Scaler protection active	IC 7752	C8
26	Reserved		
27	Scaler protection active	IC 7471	C6
28	Scaler protection active	IC 7472	C6
29	Scaler uP I2C error	IC 7753 or IC 7064	C8, A1

\* = Not applicable to Europe execution# = Only for NAF-TA 23" execution

### TV-Board

#### Errors

- Error 0 = No error
- Error 4 = +5V protection. 5V protection active; set is switched to protection; error code 4 is placed in the error buffer; the LED will blink 4 times (repeatedly). A 5V failure can cause a drop in the 5V supply output, resulting in an undefined behaviour of the set. Therefore, all I2C devices connected to the 5V supply are constantly monitored. When none of these devices responds to the micro controller for a prolonged time, the micro controller assumes that there is a failure in the 5V supply. By starting up the set with the service jumpers shorted, the 5V protection is disabled and it is easier to determine the cause. +5V protection will be activated when these I2C devices fail (no I2C communication):
  - Main Tuner 1100 (diagram A3)
  - ITT sound processor MSP34xx IC-7620 (diagram A8)

**Service tips:** To isolate the problem area after overriding the +5V protection, determine whether:

1. The +5V source is working properly IC7930 (diagram A10)
2. ITT sound processor circuit is loading the +5V; isolate coil 5620 (diagram A8)
3. The audio delay IC 7601 - IC7605 is loading the +5V source; isolate coil 5601 (diagram A7)
4. Main tuner circuit is loading the +5V source; isolate coil 5122 (diagram A3)

**Caution:** Overriding the 5V protection when there is a 5V failure can increase the temperature in the set and may cause permanent damage to components. Do not override the 5V protection for a prolonged time.

- Error 6 = General I2C error. This will occur in the following cases:
  - SCL or SDA is shorted to ground
  - SCL is shorted to SDA
  - SDA or SCL connection at the micro controller is open circuit.
- Error 8 = BOCMA IC TDA888xx (diagram A4) I2C communication failure. BOCMA (IC7301 on TV board) is corrupted or the I2C line to the BOCMA is low or no supply voltage present at pin 14 (3V3) or no supply voltage at pin 23.
- Error 9 = BOCMA IC TDA888xx 8V failure (SUP bit). No supply voltage at pin 53. Check coil 5302.
- Error 10 = NVM I2C error (diagram A1). NVM (EEPROM - IC7066) does not respond to the micro controller.
- Error 11 = Micro controller / NV Memory identification error. During the last start-up the NVM and the micro controller did not recognize each other (e.g. one of them was replaced or the NVM memory has been changed/adapted or lost), therefore the NVM was loaded with default values.
- Error 12 = Microprocessor (Painter - IC 7064) internal RAM test failure.
- Error 13 =Main Tuner I2C failure UR13xx. Tuner (item 1100, diagram A3) is corrupted or the I2C line to the tuner is low or no supply voltage at pin 3, pin 6 or 7 of the tuner.
- Error 14 =Sound processor I2C error IC7620 (MSP34xx, diagram A8). Sound controller does not respond to the micro controller.
- Error 15 =SRAM IC CY7C1019 test failure (IC7070, diagram A2).

**Note:** Only for Europe and AP-PAL execution.

### Scaler Board

When the TV detects critical errors from the Scaler board, it will shutdown into protection mode. After a short period of time, the LED will blink according to the respective error codes.

**Protection errors:**

- Error 21 = JagASM processor test failure (IC7402, diagram C4). During start-up of set, the Scaler will do a quick test by writing data to selective addresses and reading back the data. If the core supply voltage is too low or data line is broken, this error protection will be activated. Under these circumstances, check:
  - Core supply of 2V5 to VDD pins of JagASM IC.
  - Clock pulse present at pin 3 of OSC generator item 1401 (diagram C4).
- Error 22 = Video formatter/converter I2C error IC7351 (GENESIS FLI2300, diagram C9).
- Error 23 = Video decoder I2C error IC7302 (Philips SAA7118E, diagram C3).
 

**Note:** BGA IC fixed with a heat sink (see chapter 4 how to remove).
- Error 25 = NVM I2C error (diagram C8). NV memory (EEPROM - IC7752) does not respond to Scaler micro controller.
- Error 27 = SRAM IC MT48LC2M32B2TG test failure (IC7471, diagram C6).
- Error 28 = SRAM IC MT48LC2M32B2TG test failure (IC7472, diagram C6).

**Non-Protection errors:**

- Error 24 = HDTV decoder I2C error IC7252 (AD9883, diagram C10).
 

**Note:** This error is NOT applicable to Europe execution.
- Error 29 = TV uP IC7064 (diagram A1) and Scaler uP IC7753 (diagram C8) I2C communication failure. When this error occurred, there is no display on screen. In order to read this error code, either activate SDM or press "062501" to read out the error code by blinking LED. Alternatively, read the error codes out by using ComPair.

**5.4 The “Blinking LED” procedure**

The contents of the error buffer can also be made visible through the “Blinking LED” procedure. This is especially useful when there is no picture.

When the SDM is entered, the LED will blink the contents of the error-buffer. Error-codes  $\geq 10$  are shown by a long blink of 750msec, which is an indication of the decimal digit, followed by a pause of 1500msec. followed by n short blinks. When all the error-codes are displayed, the sequence is finished with a LED display of 3 seconds. The sequence starts again.

**Example:**

Error code position: 1 2 3 4 5

Error buffer: 12 9 6 0 0

This gives after activating SDM: 1 long blink of 750msec + pause of 1500msec + 2 short blinks - pause of 3 s - 9 short blinks - pause of 3 s - 6 short blinks - pause of 3 s - long blink of 3 s - etc.

**Note:** If errors 1, 2 or 4 occur, the LED **always** blinks the last occurred error, even if the set is **not** in service mode.

Another method of reading out a single error code is to use a standard RC or a DST.

- Standard RC - Press “0-6-2-5-0-x” in sequence, to read (blinking LED) out a respective error code in the error buffer, where x = 1, 2, 3, 4, 5, 6, or 7.
- DST: Press “Diagnose” “x” “OK” to read (blinking LED) out a respective error code in the error buffer, where x = 1, 2, 3, 4, 5, 6, or 7.

**5.5 Trouble Shooting Tips****5.5.1 Scaler/TV Board Power Supply Problems**

In this paragraph some troubleshooting steps for checking the power supply of the Scaler-board and TV-board circuitry are described.

- Measure across pin-1 and pin-4 of connector 1003 (diagram C1). +12V (15" and 17") or +24V (23") should be present. If the voltage is not present, probably is caused by:
  - AC to DC adaptor is defect.
  - Short circuit in TV-board (can be isolated by connector 1003).
  - Fuse 1002 is open circuit.
- Measure across C2923 (diagram A10). +3V3 should be present. If not present, probably this is caused by:
  - IC7920 is defective.
  - R3925 is defective.
  - The power supply circuit (diagram C1) is defective (see Scaler-board circuit trouble shooting tips).
- Measure R3017 or R3085 (diagram A1) with oscilloscope. There should be I2C activity. If no activity is present, this probably is caused by:
  - IC 7064 micro-P is defective.
  - The I2C clock line or data line is grounded. (LED should blink indicating SW protection is active).
  - The IC 7064 reset circuit consisting of T7063, T7067 and T7069 and its surrounding components are defective.
- Measure pin-19 of connector 1010 (diagram A1). The standby signal should be high (2V9). If not high, probably this is caused by:
  - IC 7064 micro-P is defective (output port pin-13).
  - Transistor 7062 is defective.
- Measure across C2913/C2933 (diagram A10). +8V3/+5V4 should be present respectively. If not present, probably this is caused by:
  - IC 7910/7930 regulator is defective.
  - Fuse 1903 is defective.
  - Switching FET 7900 is defective.
  - Transistor T7901 is defective.
- Measure across C2007 (diagram C1). +5V should be present. If not present, probably this is caused by:
  - +5V grounded by the load.
  - Regulator IC 7001 is defective.
  - Control transistor T7003/T7002 is defective.
  - Scaler power control signal line (POW-CON-SCALER coming from TV-board) is defective.
- Measure pin-4 or pin-5 of connector 1402 (diagram C4). Pin-4 should be high (+4V7) and pin-5 also should be high (+3V4). If one/both of the voltage is not present, probably this is caused by:
  - IC 7402 (JagASM) is defective.
  - Transistor 7403 is defective.
  - Inverter board is defective.
- Measure pin-4 or pin-5 of connector 1402 (diagram C4). Pin-4 should be high (+4V7) and pin-5 also should be high (+3V4). If one/both of the voltage is not present, probably this is caused by:
  - IC 7402 (JagASM) is defective.
  - Transistor T7403 is defective.
  - Inverter board is loading either of the voltage.

### 5.5.2 General Problems

#### **TV switched "off" or changed channel without any user action**

Set switches off after "TV SWITCHING OFF" was displayed.  
"Auto Standby" switched the set "off" because:

- There was no ident signal for more than 15 minutes.
- There was no remote control signal received or local key pressed for > 2 hours.

See chapter 8 for a description on the options to enable/disable "Auto Standby".

### 5.5.3 Picture problems

#### **Picture too dark or too bright**

- Press "Smart Picture" button on the remote control. In case the picture improves, increase / decrease the brightness value or increase / decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.
- After switching on the Customer Service Mode the picture is OK. Increase / decrease the brightness value or increase / decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.

#### **Snowy picture**

Check the "NOT TUNED" section of the Customer Service Mode screen.

#### **Snowy picture and/or unstable picture**

A scrambled or decoded signal is received.

#### **Black and white picture**

- Press "Smart Picture" button on the remote control. In case picture improves, increase the colour value. The new "Personal Preference" value is automatically stored after 3 minutes.
- After switching on the Customer Service Mode the picture is OK. Increase the colour value. The new "Personal Preference" value is automatically stored after 3 minutes.

#### **Menu text not sharp enough**

- Press "Smart Picture" button on the remote control. In case the picture improves, decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.
- After switching on the Customer Service Mode the picture is OK. Decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.

### 5.5.4 Sound problems

#### **No sound or sound too loud (after channel change / switching on)**

After switching on the Customer Service Mode the volume is OK. Increase / decrease the volume level. The new "Personal Preference" value is automatically stored after 3 minutes.

### 5.5.5 Extra information/tips:

- Complaints that may be caused by an incorrect system setting:
  - No colours
  - Colours not correct
  - Unstable picture
  - Noise in picture
 To change the system setting of a preset:
  1. Press the "MENU" button on the remote control
  2. Select the INSTALL sub menu
  3. Select the MANUAL STORE sub menu
  4. Select and change the SYSTEM setting until picture and sound are correct

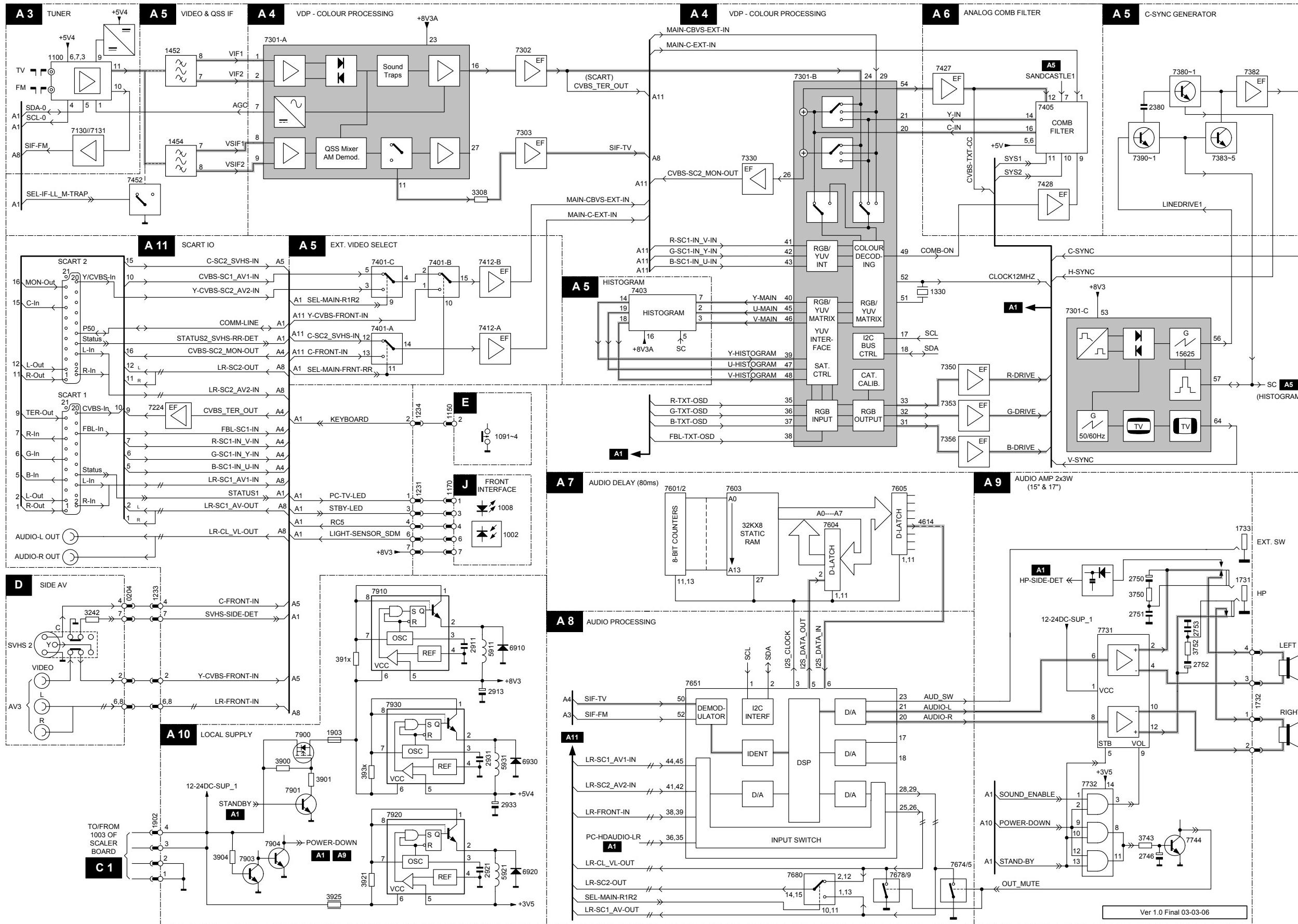
#### 5. Select the STORE menu item

- When the set is in PC mode and there is no VGA signal present at PC-in connector, the set will shutdown to standby in couple of seconds after showing "NO VIDEO INPUT". This is a normal behaviour of the set to save power.
- The Scaler is the driving engine of the LCD panel. When there is no display and OSD on screen, check whether sound is producible on TV channel. If sound is audible, most likely the defective lies in Scaler board or inverter board.
- To know fast whether inverter is functioning, visually check if the backlights are "on" by looking at the back of the LCD panel. Some bright spots can be seen on the side. Other way to tell whether the backlight is working is to switch the set to AV mode. The front of the screen had some kind of "fogged" effect.
- Note:** when one of the backlight connectors has loosened, the inverter circuit will be shut down.
- If the supply to the LCD panel is OK (likewise for backlight supply), but no data signals (example: signals on connector 1506) supplied from Scaler to LCD panel, you will notice that the LCD screen will show full screen in sequential of BLUE, GREEN, RED, BLANK, dark-GREY, light-GREY and WHITE repeatedly. It means LCD panel is in good condition. The fault lies in the Scaler board

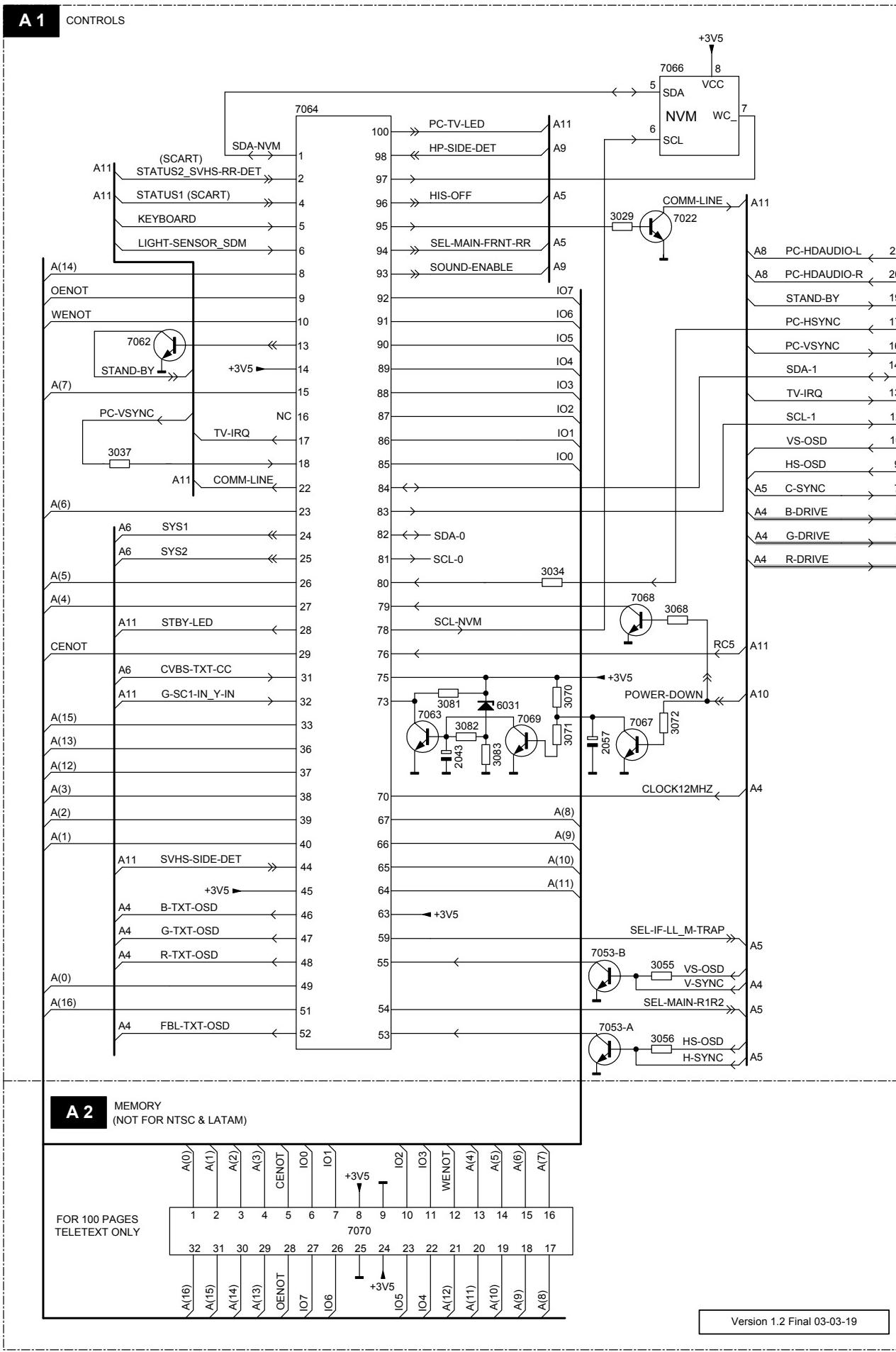
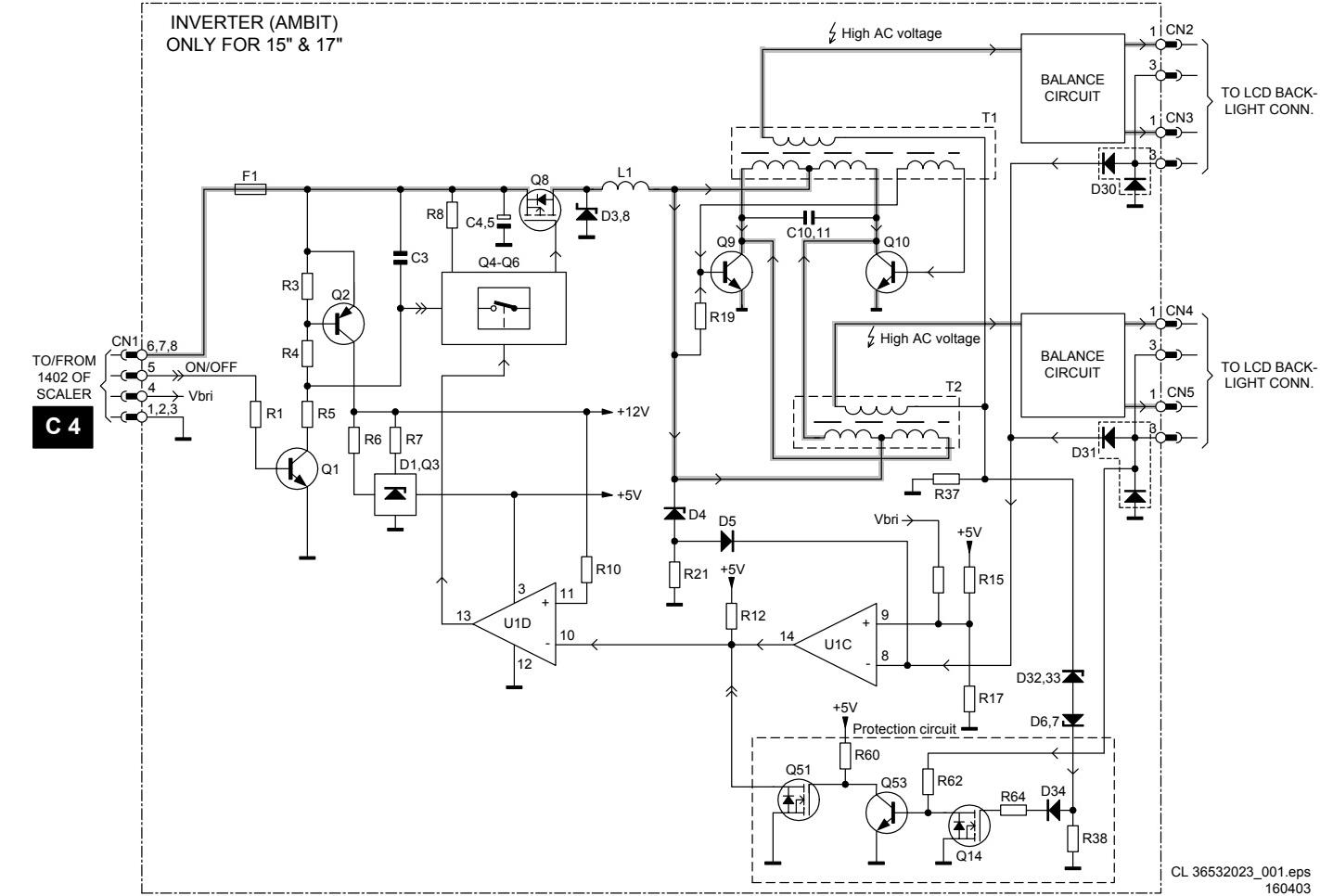
## ***Personal Notes:***

## 6. Block Diagrams, Testpoint Overviews, and Wiring Diagram

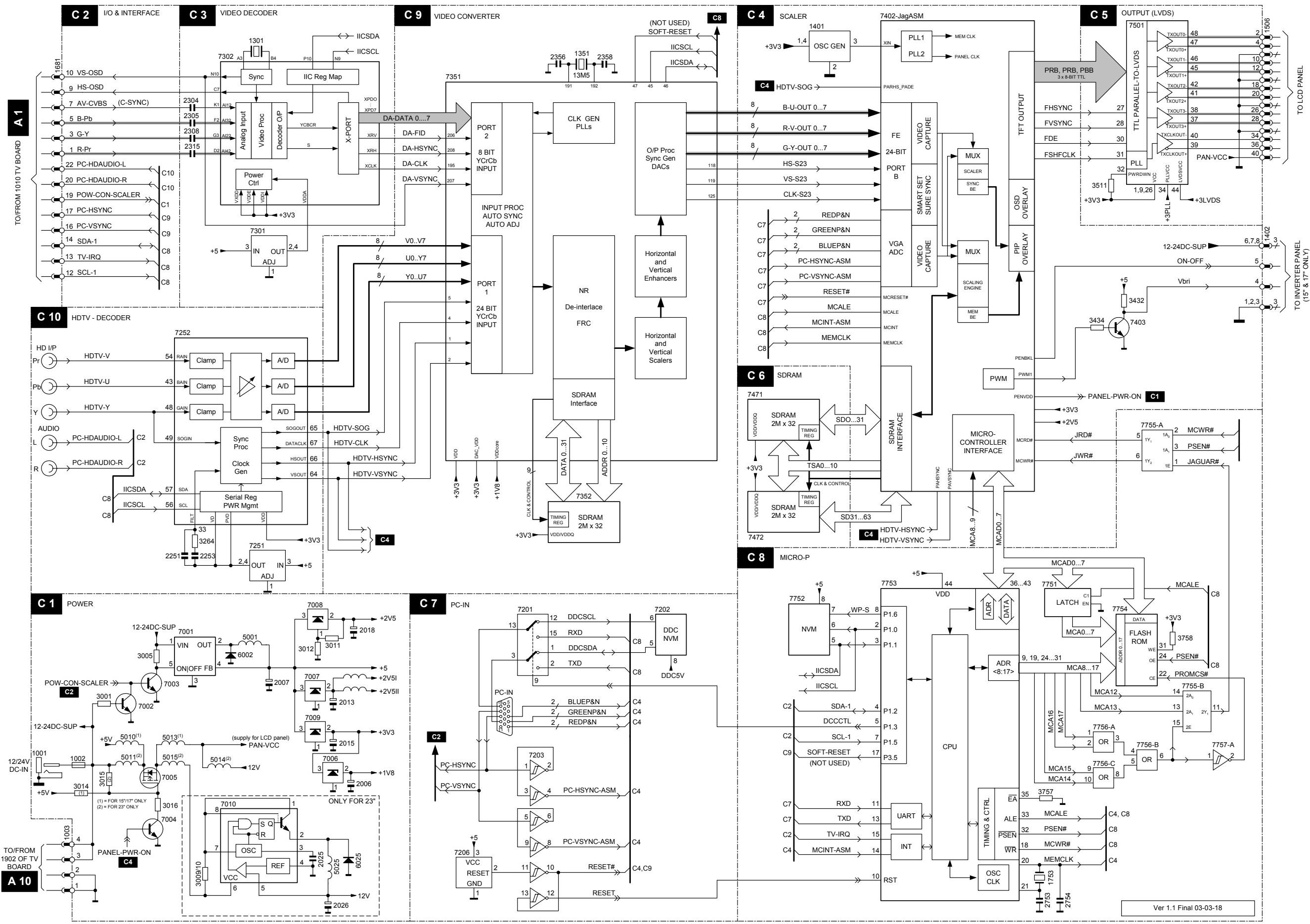
### Block Diagram (Tuner-IF-Video)



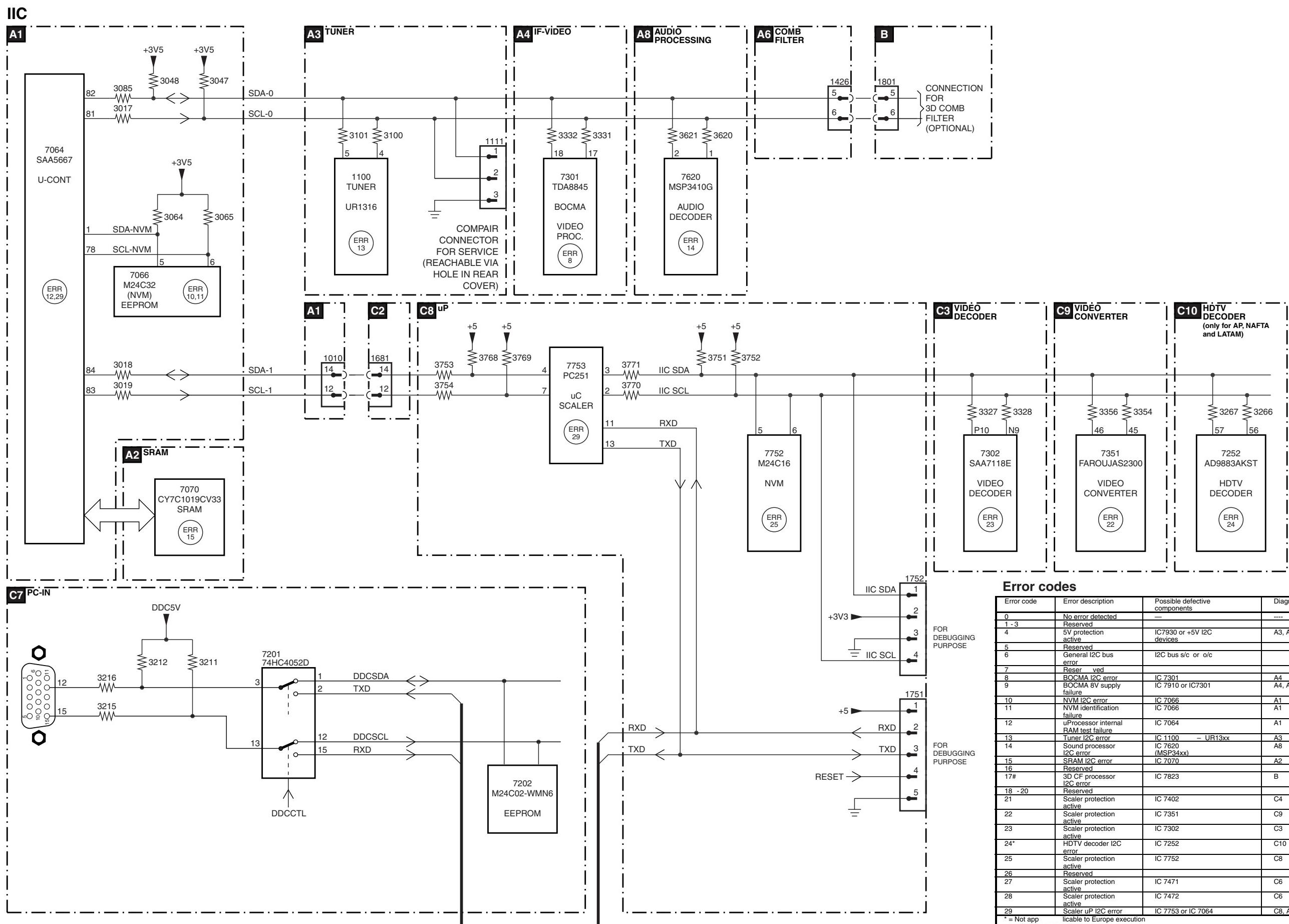
## Block Diagram (TV Control and Inverter Panel)

**C 2**

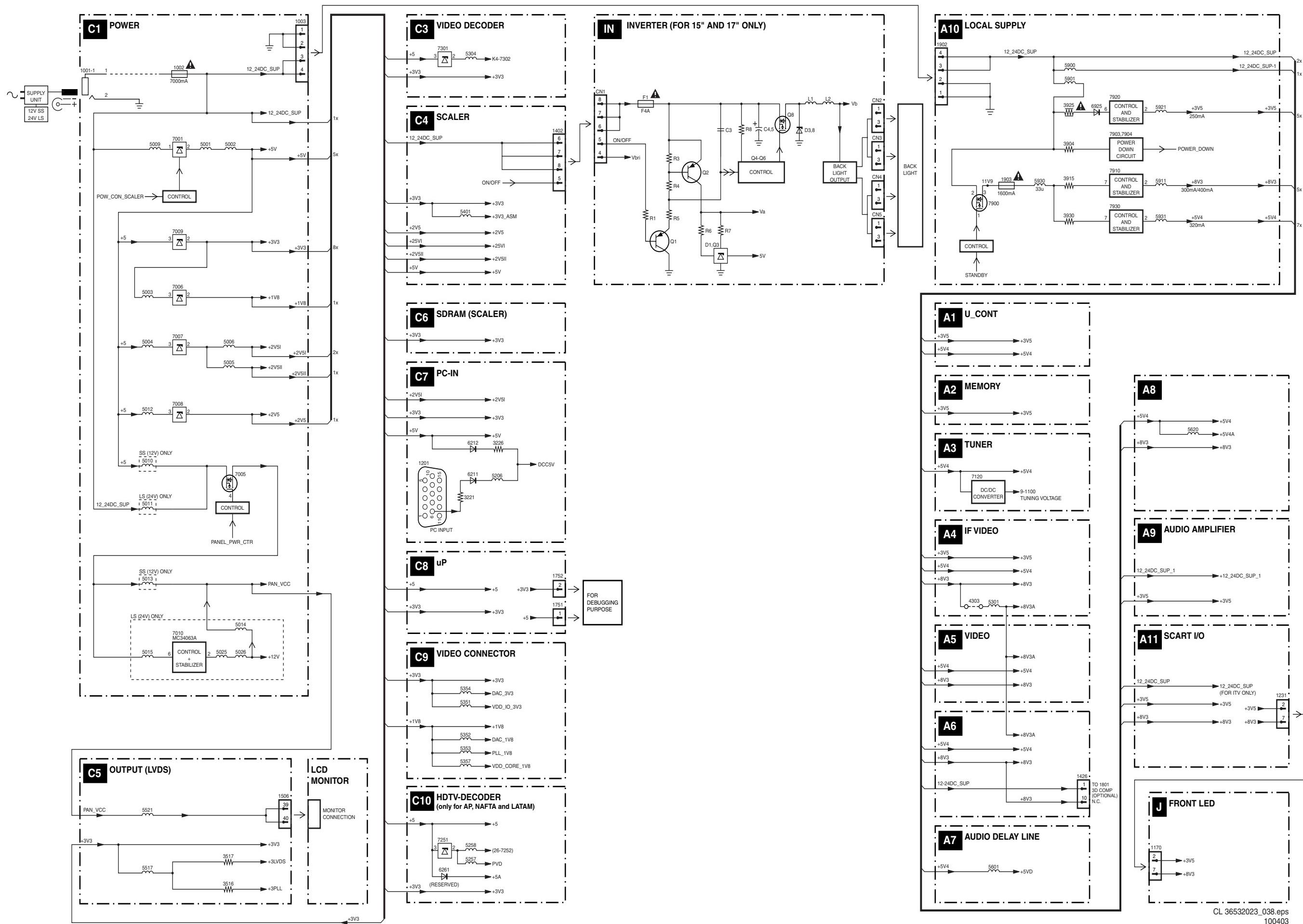
## Block Diagram (Scaler Board)

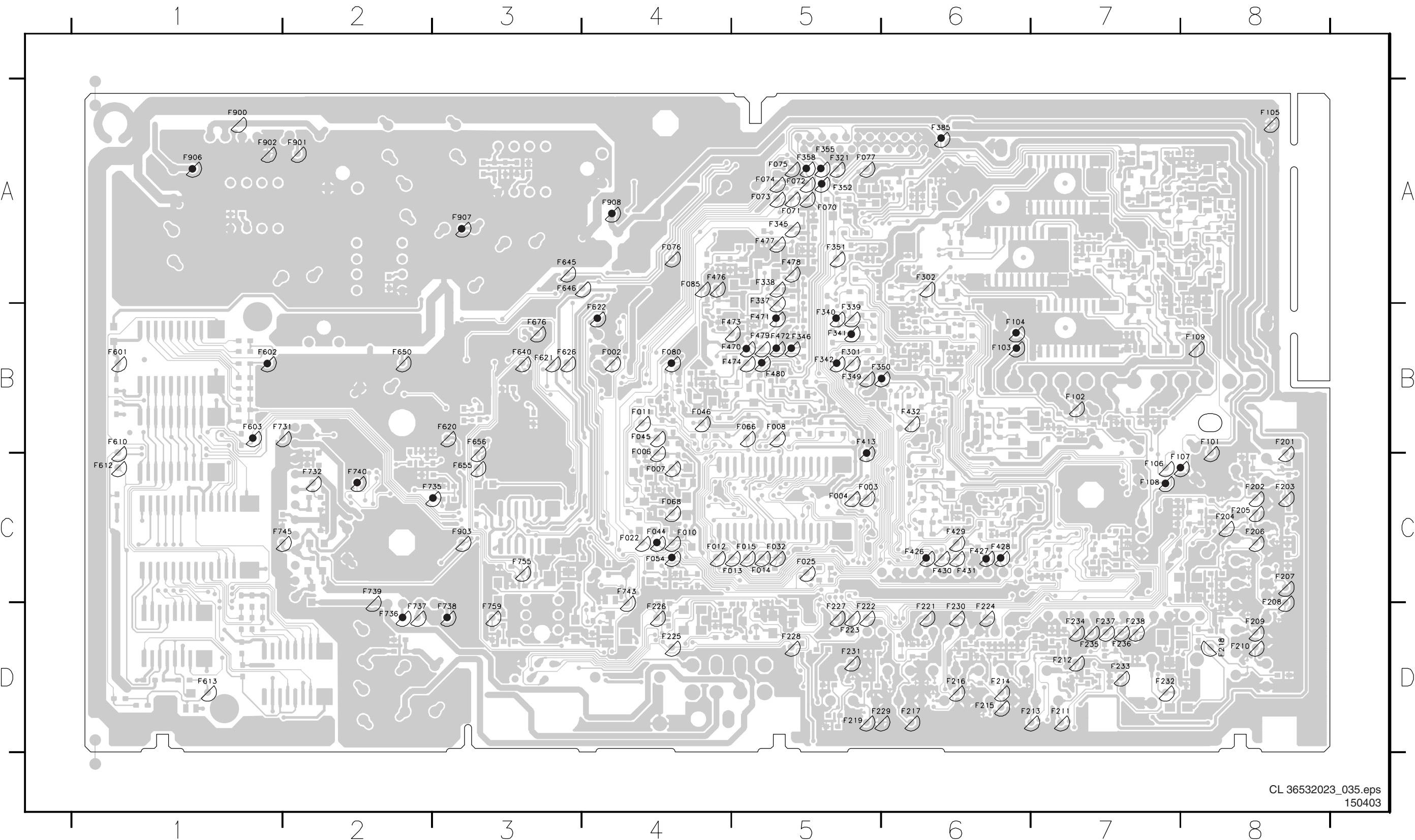


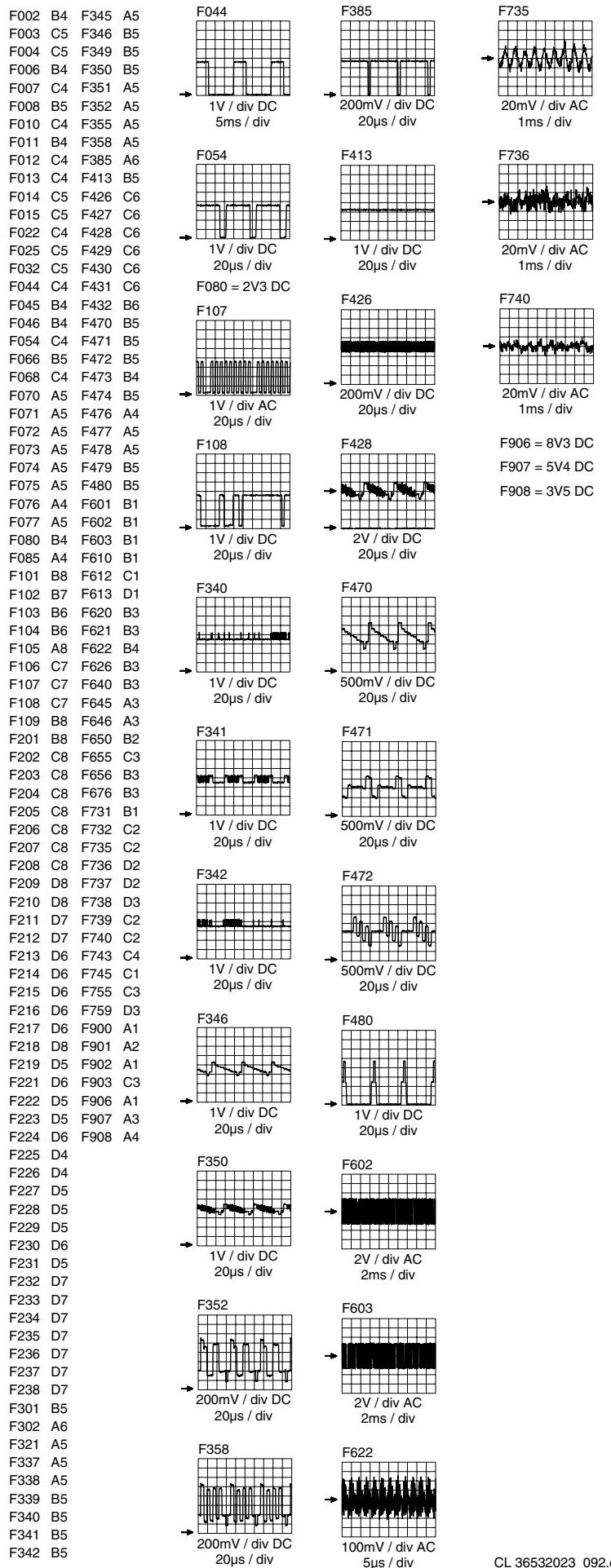
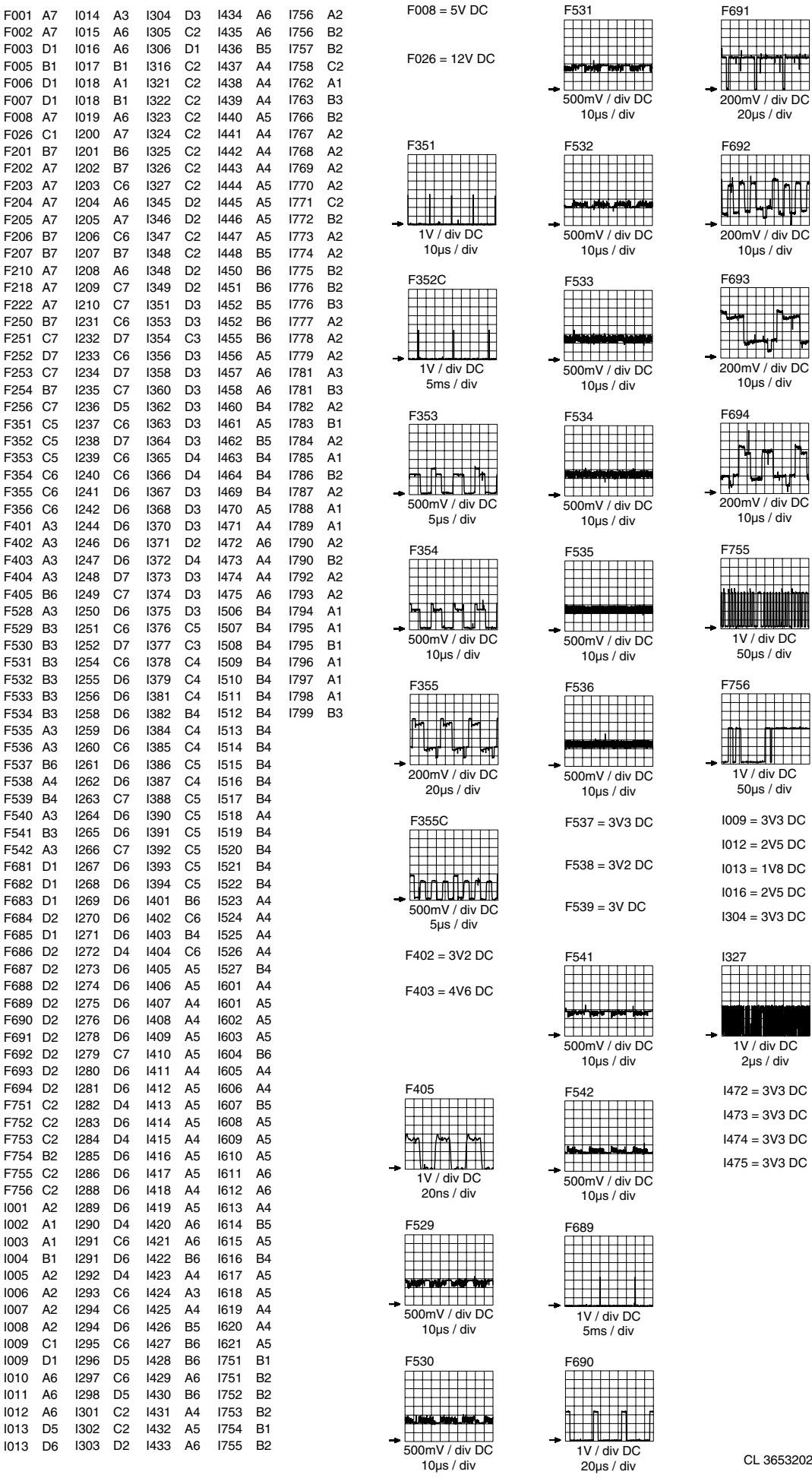
## I2C-IC's and Error Codes Overview

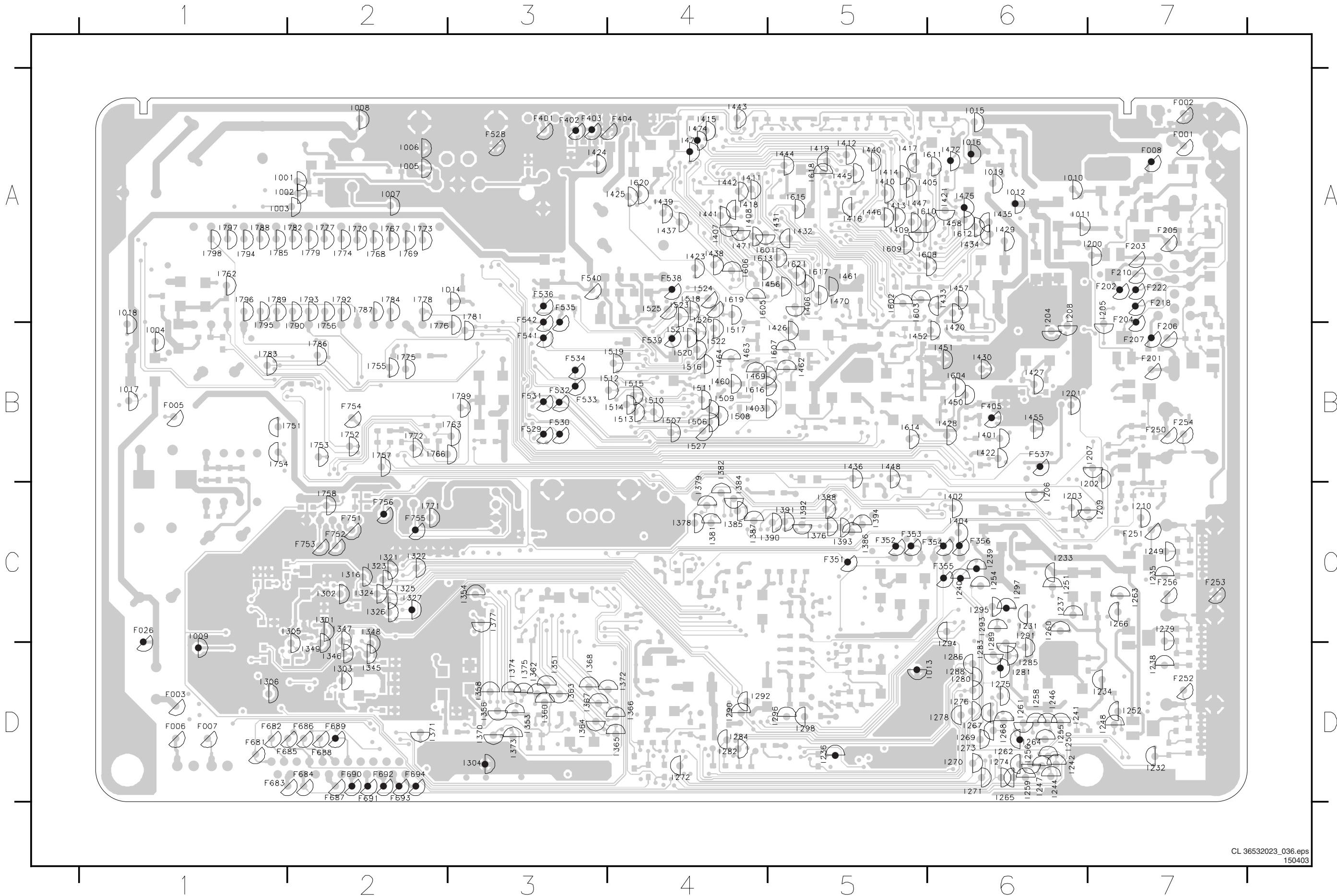


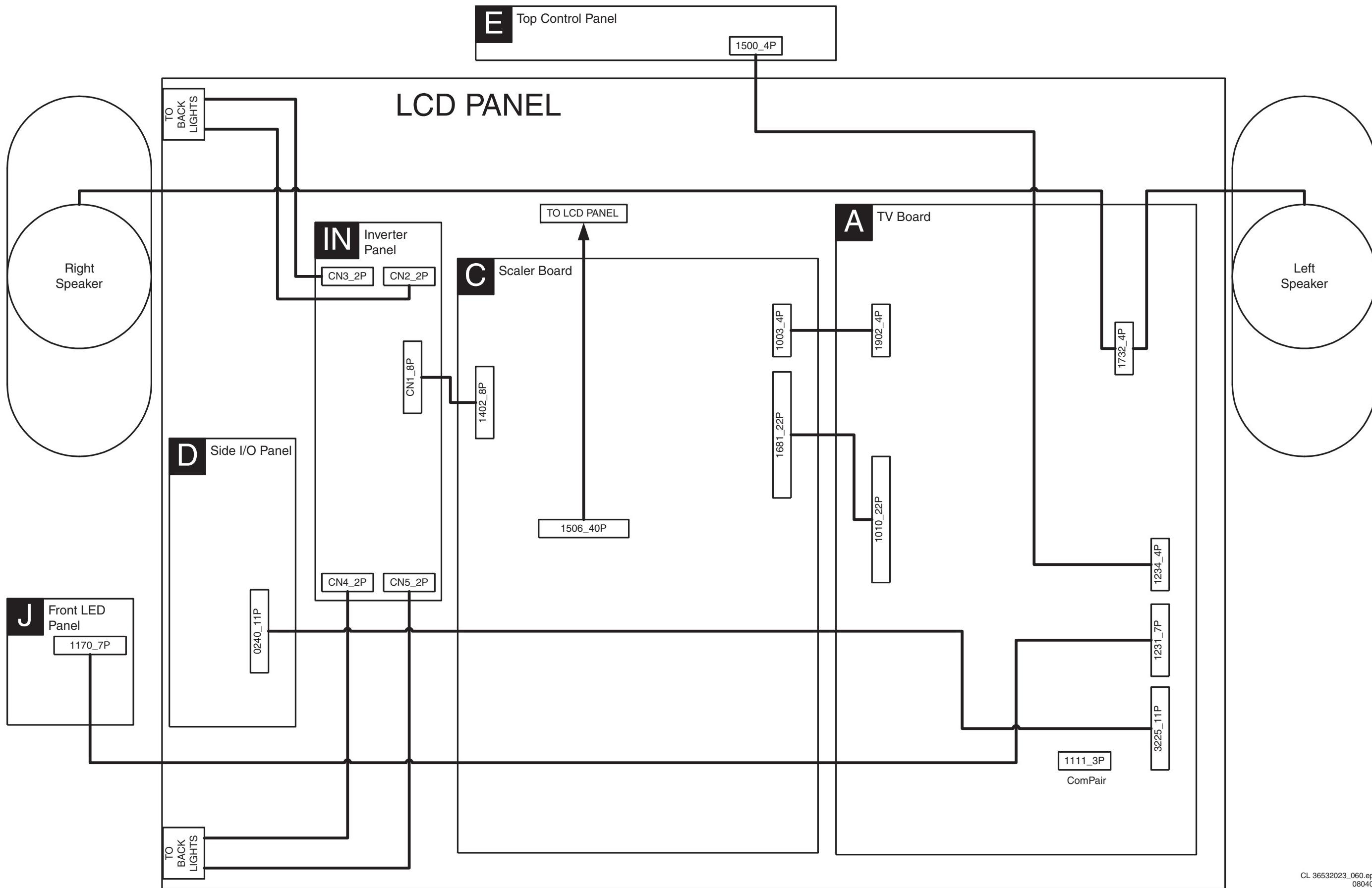
## Powerlines Overview



**Testpoint Overview TV Board**

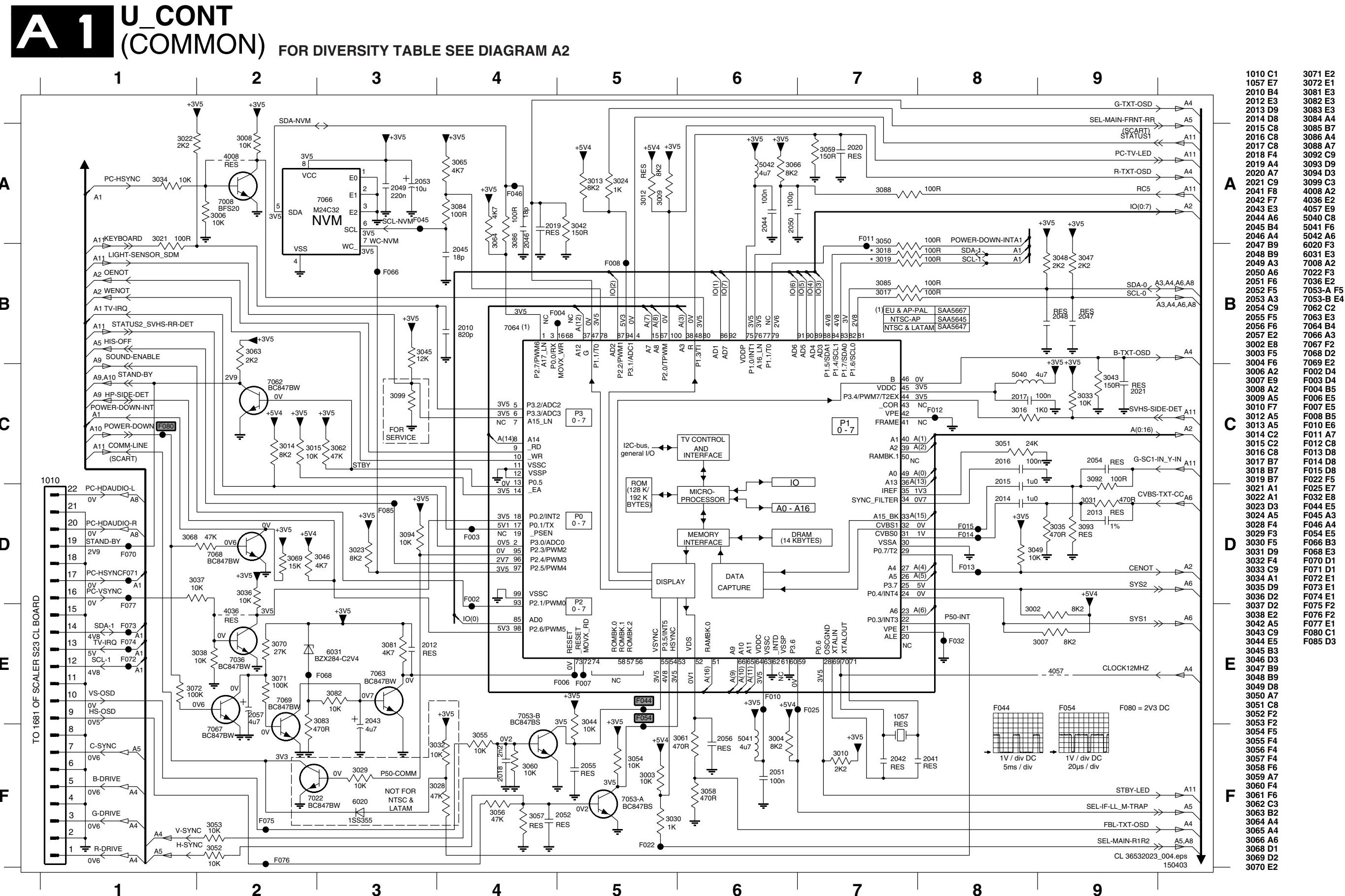
**Mapping Testpoint Overview and Waveforms TV Board****Mapping Testpoint Overview and Waveforms Scaler Board**

**Testpoint Overview Scaler Board**

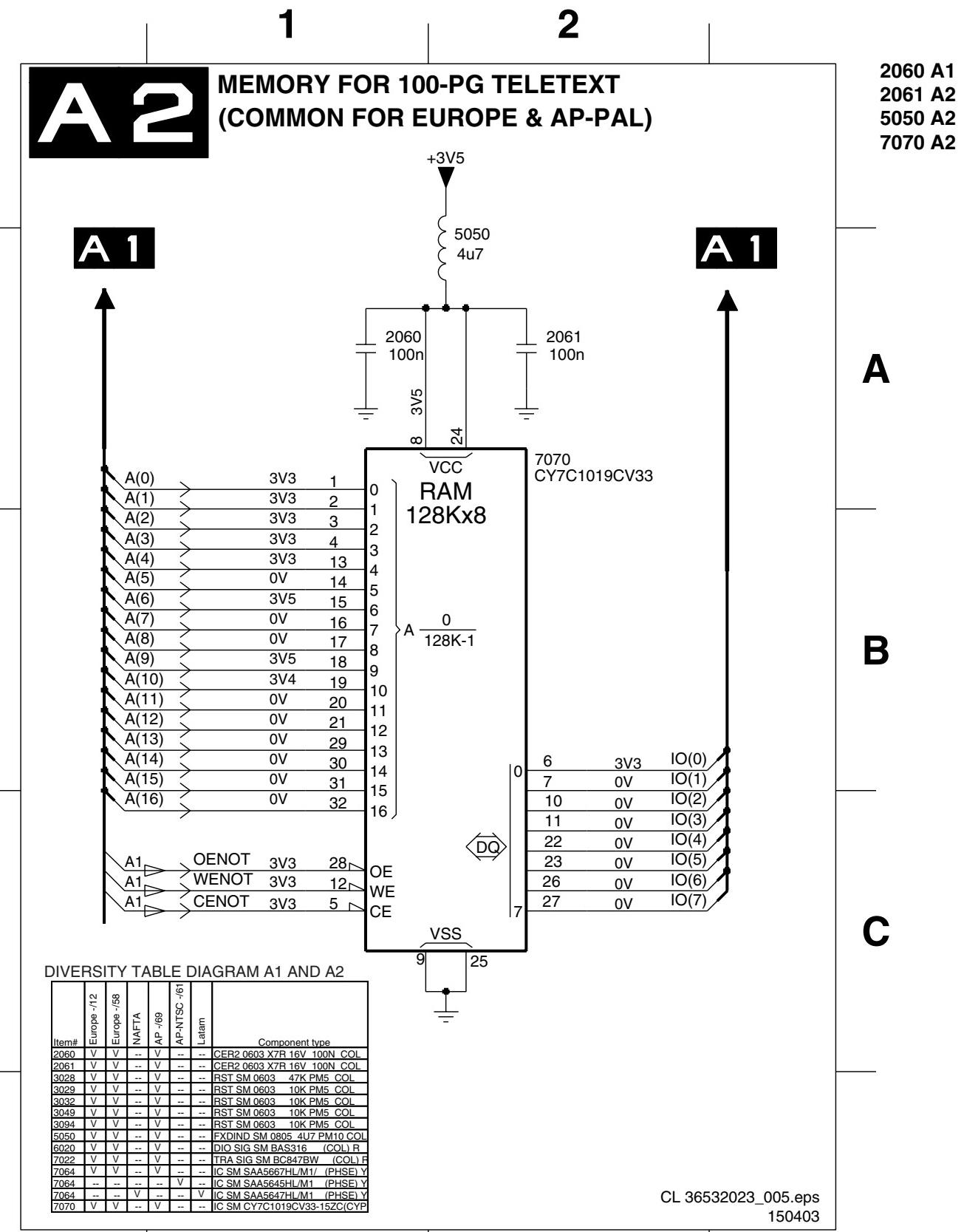
**Wiring Diagram****Wiring Diagram 15" & 17"WS**

## 7. Circuit Diagrams and PWB Layouts

### TV Board: U\_Cont



## **TV Board: Memory for 100-pg Teletext**



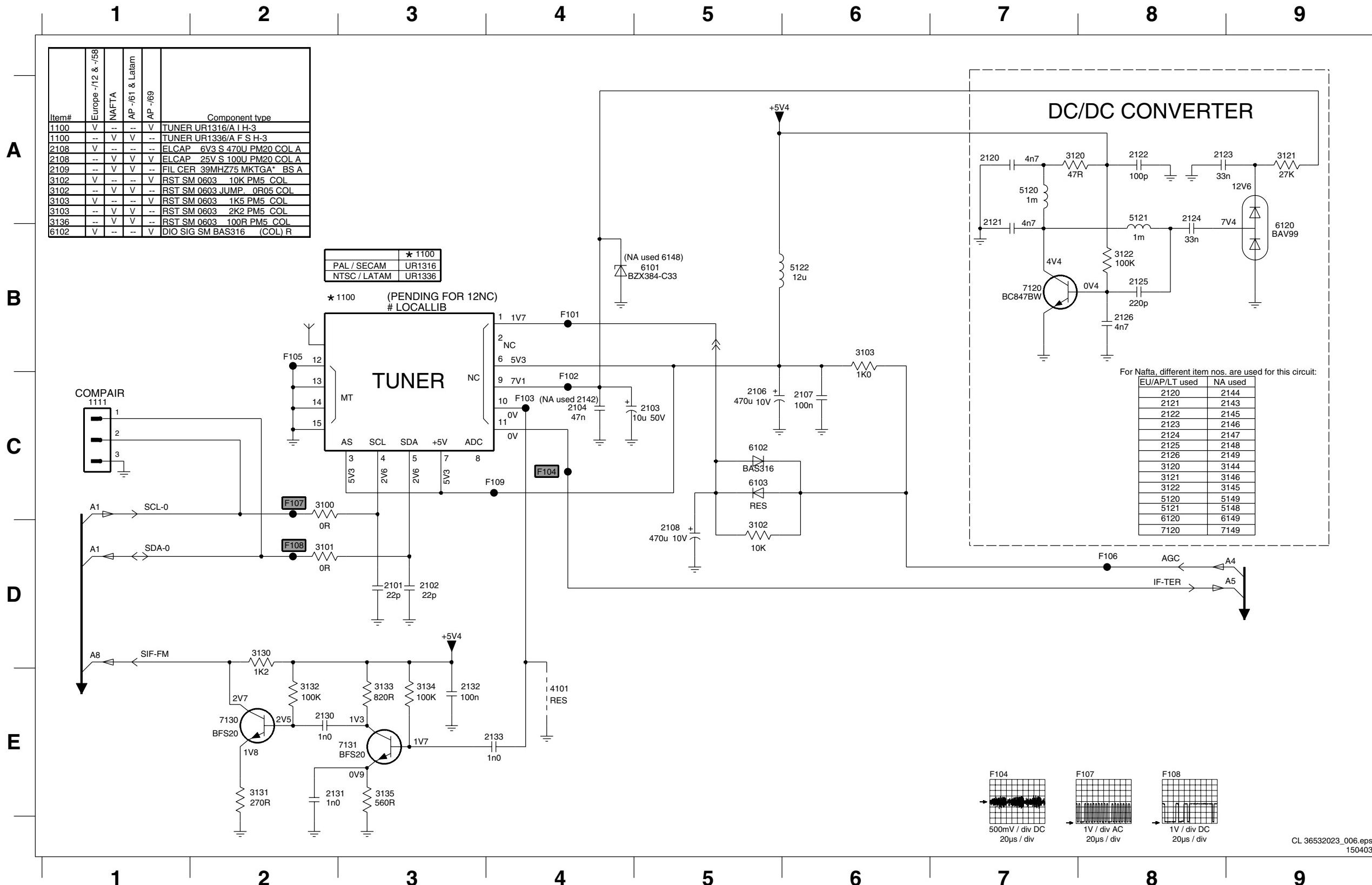
## **Personal Notes:**

**2060 A1  
2061 A2  
5050 A2  
7070 A2**

CL 36532023\_005.eps  
150403

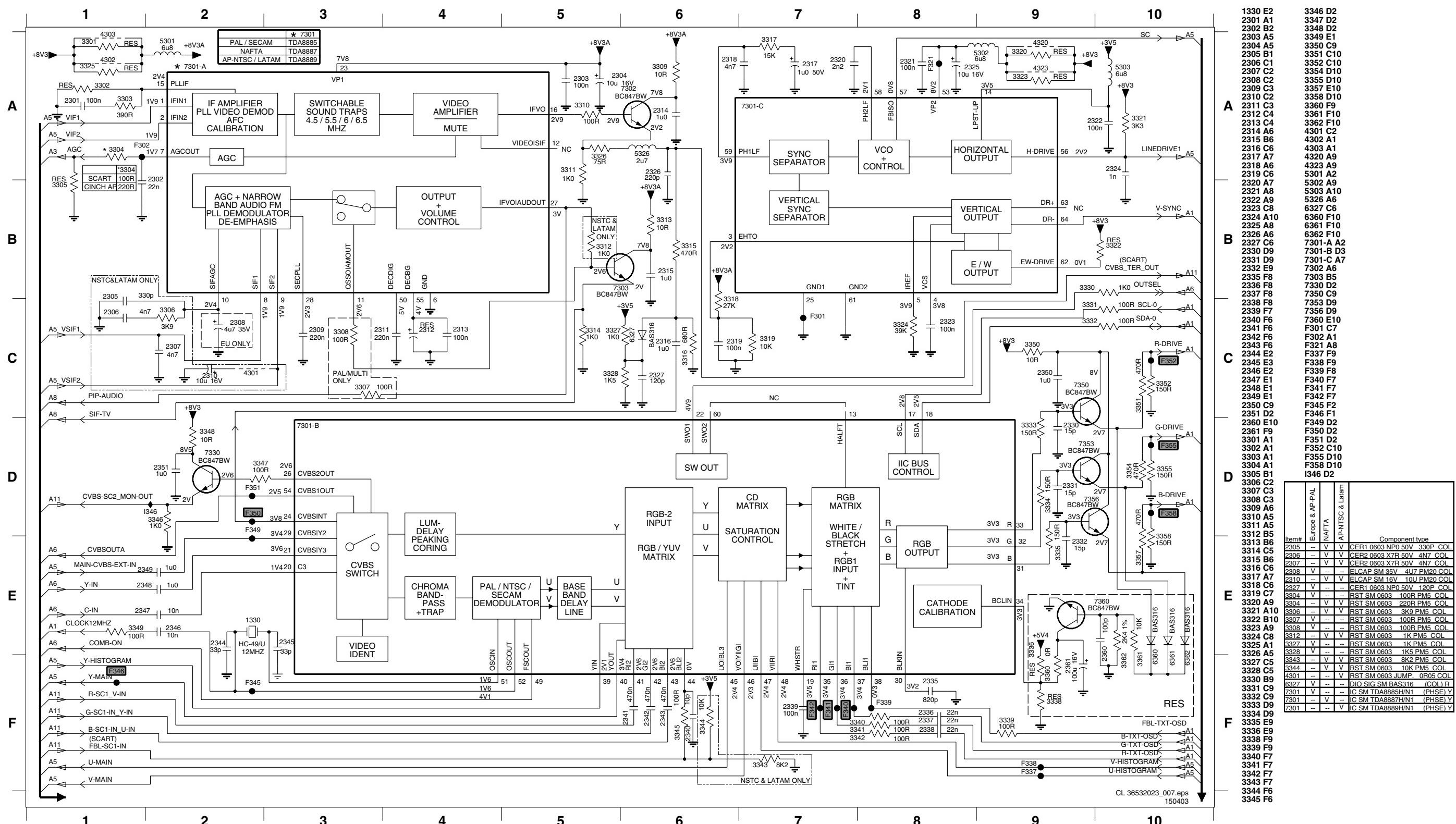
## TV Board: Tuner Function

# A3 TUNER FUNCTION (15"/17"/23" SCART)

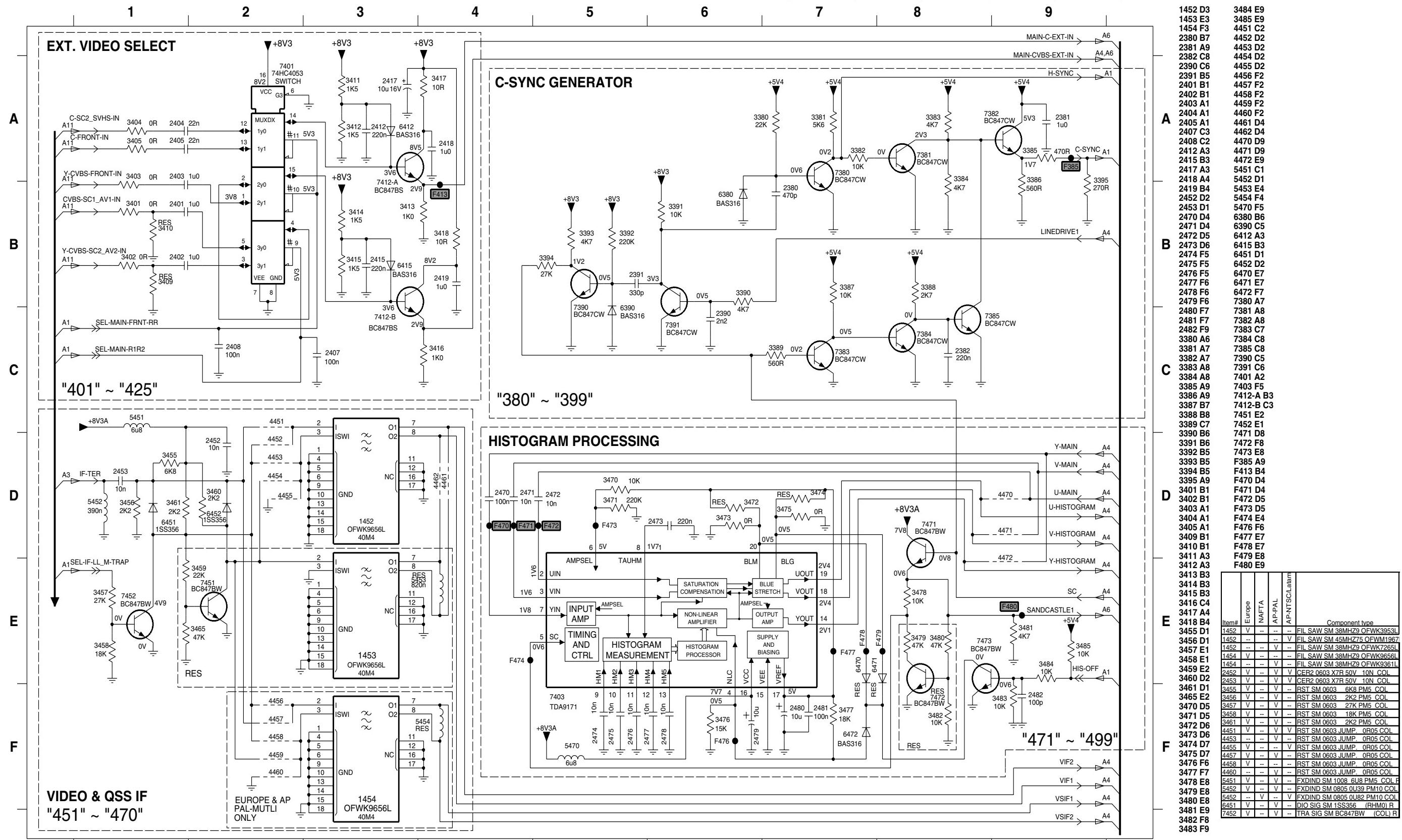
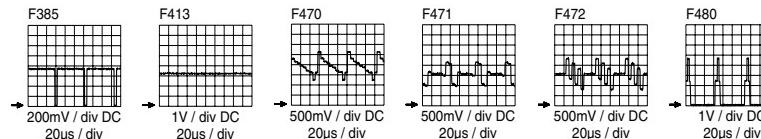


1100 B2  
1111 C1  
2101 D3  
2102 D3  
2103 C5  
2104 C4  
2106 C5  
2107 C6  
2108 D5  
2120 A7  
2121 A7  
2122 A8  
2123 A8  
2124 A8  
2125 B8  
2126 B8  
2130 E2  
2131 E2  
2132 E3  
2133 E4  
3100 C2  
3101 D2  
3102 D5  
3103 B6  
3120 A7  
3121 A9  
3122 B8  
3130 D2  
3131 E2  
3132 E2  
3133 E3  
3134 E3  
4101 E4  
5120 A7  
5121 A8  
5122 B6  
6101 B5  
6102 C5  
6103 C5  
6120 B9  
7120 B7  
7130 E2  
7131 E3  
F101 B4  
F102 C4  
F103 C4  
F104 C4  
F105 B2  
F106 C8  
F107 C2  
F108 D2  
F109 C4

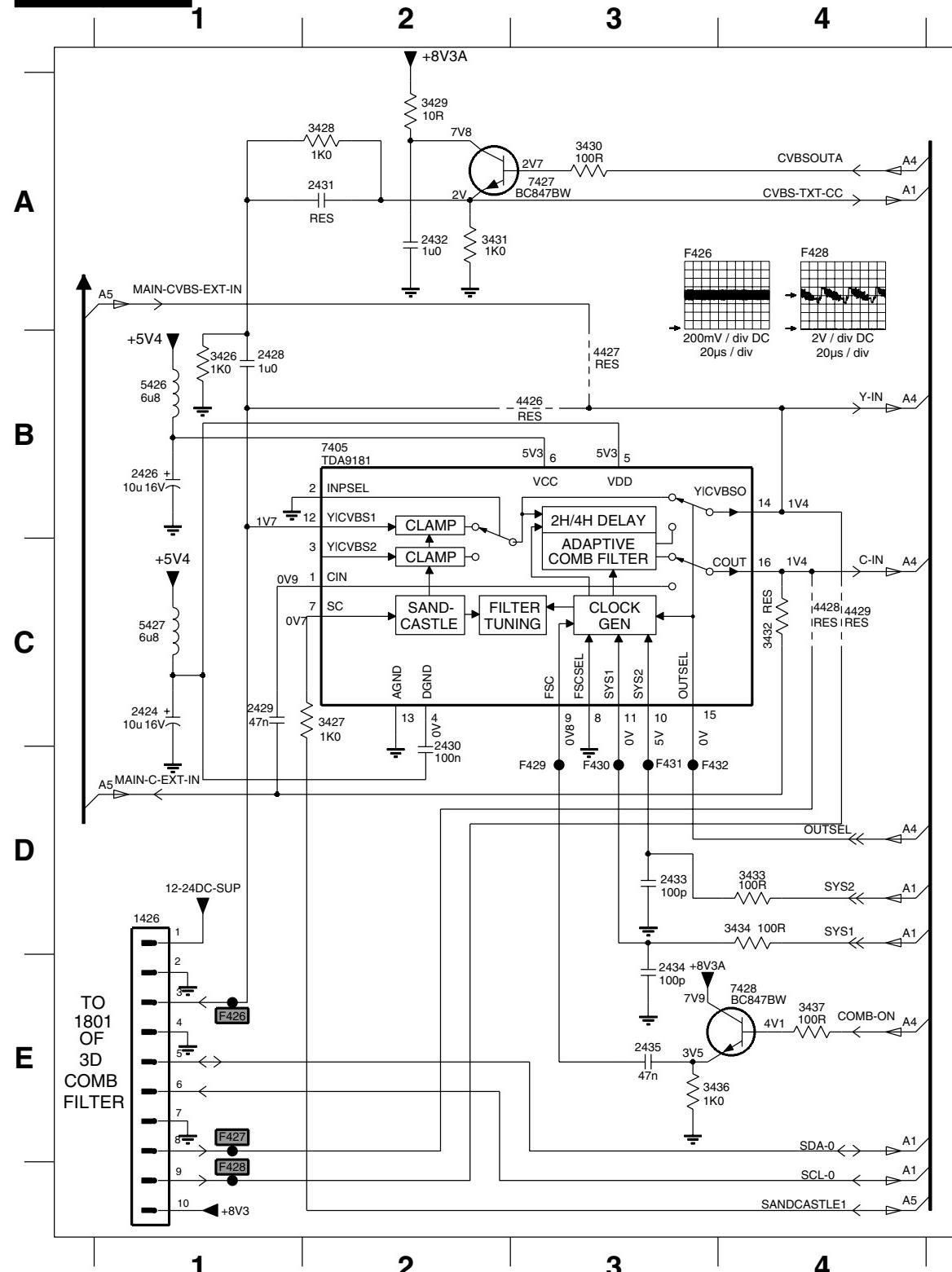
## TV Board: IF Video Sync Chroma

**A 4 IF-VIDEO -SYNC-CHROMA**  
(15"/17"/23" EUROPE, AP & LATAM )


## TV Board: SAW Filter, Ext. Video Select, Histogram, &amp; C-Sync Generator

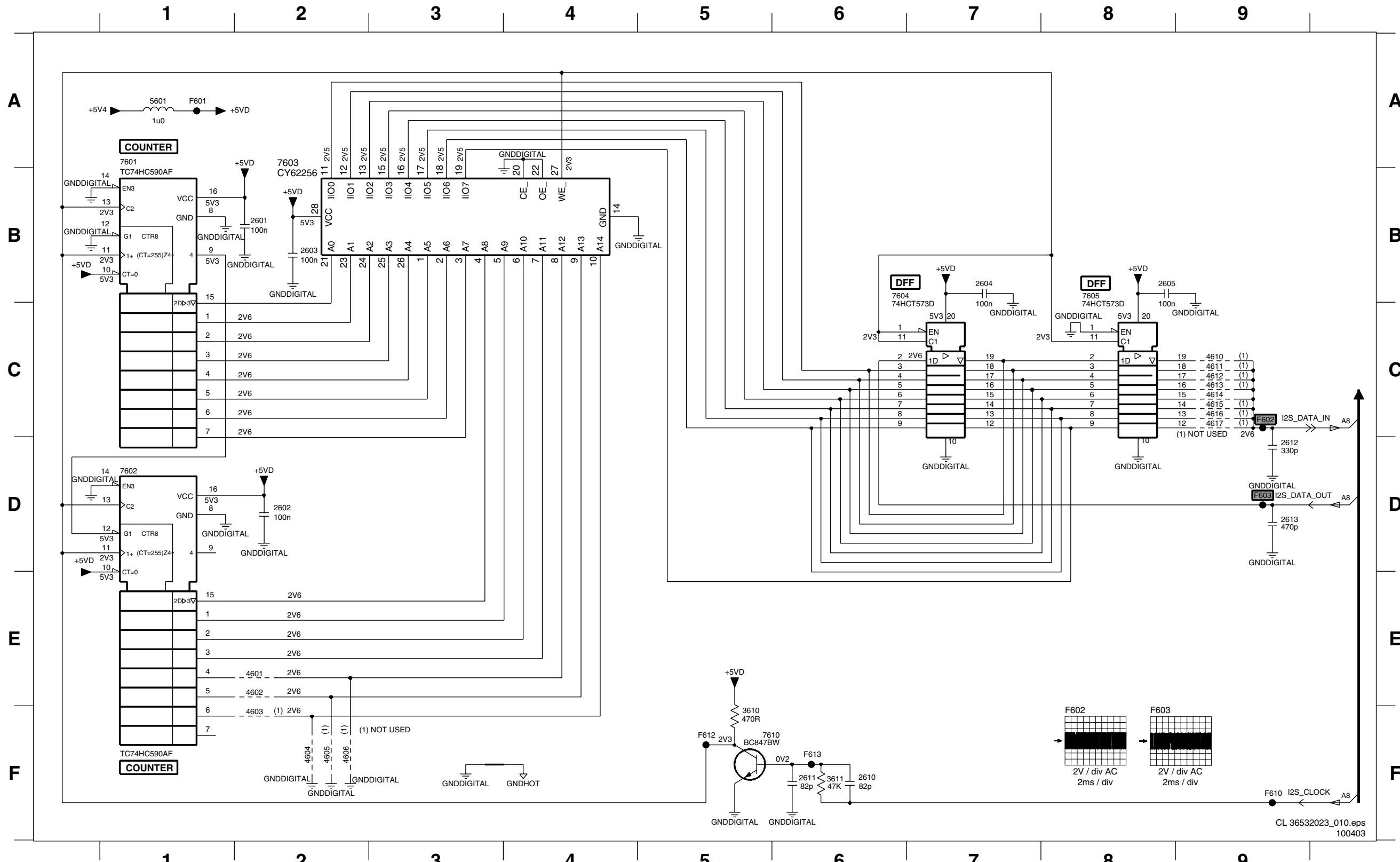
**A5** SAW FILTER, EXT. VIDEO SELECT, HISTROGRAM & C-SYNC GEN  
(15"/17"/23" EUROPE & AP-PAL)


## TV Board: Analog Comb Filter

**A 6 ANALOG COMB FILTER  
(15"/17"/23" EUROPE, AP & LATAM)**
CL 36532023\_009.eps  
150403

Item#	3D Combiner 23" NAFTA	3L Combiner 15"/17" NAFTA
Component type		
1426 D1	CON BM V 10P M 2.50 EH B	
2424 C1	--	
2426 B1	ELCAP SM 16V 10U PM20 COL R	
2428 B1	CON BM V 10P M 2.50 EH B	
2429 C1	--	
2430 D2	ELCAP SM 16V 10U PM20 COL R	
2431 A2	CER2 0603 X7R 16V 100N COL	
2432 A2	CER2 0603 Y5V 50V 10N COL	
2433 D3	CER2 0603 Y5V 50V 10N COL	
2434 E3	CER2 0603 X7R 50V 4N7 COL	
2435 E3	CER2 0603 Y5V 50V 10N COL	
2436 B1	CER2 0603 Y5V 50V 10N COL	
2437 C2	CER2 0603 X7R 16V 100N COL	
3428 A2	ELCAP SM 16V 10U PM20 COL R	
3429 A2	CER2 0603 Y5V 50V 10N COL	
3430 A3	ELCAP SM 16V 10U PM20 COL R	
3431 A2	CER1 0603 NPO 50V 12P COL	
3432 C4	ELCAP SM 16V 10U PM20 COL R	
3433 D4	CER2 0603 X7R 16V 100N COL	
3434 D4	CER2 0603 Y5V 50V 10N COL	
3436 E3	CER1 0603 NPO 50V 12P COL	
3437 E4	CER2 0603 X7R 16V 100N COL	
4426 B3	CER2 0603 Y5V 50V 10N COL	
4427 B3	ELCAP SM 16V 10U PM20 COL R	
4428 C4	CER1 0603 NPO 50V 180P COL	
4429 C4	CER2 0603 Y5V 50V 10N COL	
5426 B1	ELCAP SM 16V 10U PM20 COL R	
5427 C1	CER1 0603 NPO 50V 12P COL	
7405 B2	ELCAP SM 16V 10U PM20 COL R	
7427 A3	CER1 0603 NPO 50V 12P COL	
7428 E4	CER2 0603 X7R 16V 100N COL	
F426 E1	ELCAP SM 50V 1U PM20 COL R	
F427 E1	ELCAP SM 16V 10U PM20 COL R	
F428 E1	CER1 0603 NPO 50V 15P COL	
F429 D3	CER1 0603 NPO 50V 15P COL	
F430 D3	RST SM 0603 8K2 PM5 COL	
F431 D3	RST SM 0603 15K PM5 COL	
F432 D3	RST SM 0603 470K PM5 COL	
3159	RST SM 0603 10K PM5 COL	
3160	RST SM 0603 15K PM5 COL	
3161	RST SM 0603 470K PM5 COL	
3162	RST SM 0603 10K PM5 COL	
3163	RST SM 0603 820R PM5 COL	
3164	RST SM 0603 10K PM5 COL	
3165	RST SM 0603 10K PM5 COL	
3166	RST SM 0603 10K PM5 COL	
3167	RST SM 0603 100R PM5 COL	
3168	RST SM 0603 12K PM5 COL	
3169	RST SM 0603 33K PM5 COL	
3170	RST SM 0603 33K PM5 COL	
3171	RST SM 0603 3K3 PM5 COL	
3172	RST SM 0603 820R PM5 COL	
3173	RST SM 0603 100R PM5 COL	
3174	RST FUSE NFR26 S 4R7 PM5 A	
3426	RST SM 0603 1K PM5 CO L	
3427	RST SM 0603 1K PM5 CO L	
3428	RST SM 0603 560R PM5 COL	
3428	RST SM 0603 JUMP. 0R05 COL	
3432	RST SM 0603 33K PM5 COL	
3433	RST SM 0603 3K3 PM5 COL	
3434	RST SM 0603 33K PM5 COL	
3435	RST SM 0603 10K PM5 COL	
3436	RST SM 0603 12K PM5 COL	
3437	RST SM 0603 470R PM5 COL	
3438	RST SM 0603 820R PM5 COL	
3439	RST SM 0603 560R PM5 COL	
3440	RST SM 0603 15K PM5 COL	
3441	RST SM 0603 1K PM5 CO L	
3442	RST SM 0603 560R PM5 COL	
3443	RST SM 0603 6K8 PM5 COL	
3444	RST SM 0603 820R PM5 COL	
3445	RST SM 0603 1K PM5 CO L	
3446	RST SM 0603 1K5 PM5 COL	
3447	RST SM 0603 1K PM5 CO L	
3448	RST SM 0603 1K PM5 CO L	
5156	FXDIND SM 0805 15U PM20 COL	F
5166	FXDIND SM 0805 15U PM20 COL	F
5171	FXDIND 0805 100MHZ 120R COL	F
5172	FXDIND SM 0805 15U PM20 COL	F
5173	FXDIND SM 0805 15U PM20 COL	F
5174	FXDIND SM 0805 27U PM20 COL	F
5431	FXDIND SM 0805 27U PM20 COL	F
5433	FXDIND SM 0805 15U PM20 COL	F
5434	FXDIND SM 0805 15U PM20 COL	F
5435	FXDIND SM 0805 33U PM20 COL	F
7160	IC SM TC90A53F (TOSJ) R	
7170	TRA SIG SM BC847BS (PHSE) R	
7432	TRA SIG SM BC847BS (PHSE) R	
7433	TRA SIG SM BC847BW (COL) R	
7434	TRA SIG SM BC847BPN (PHSE) R	

## TV Board: Audio Delay Line

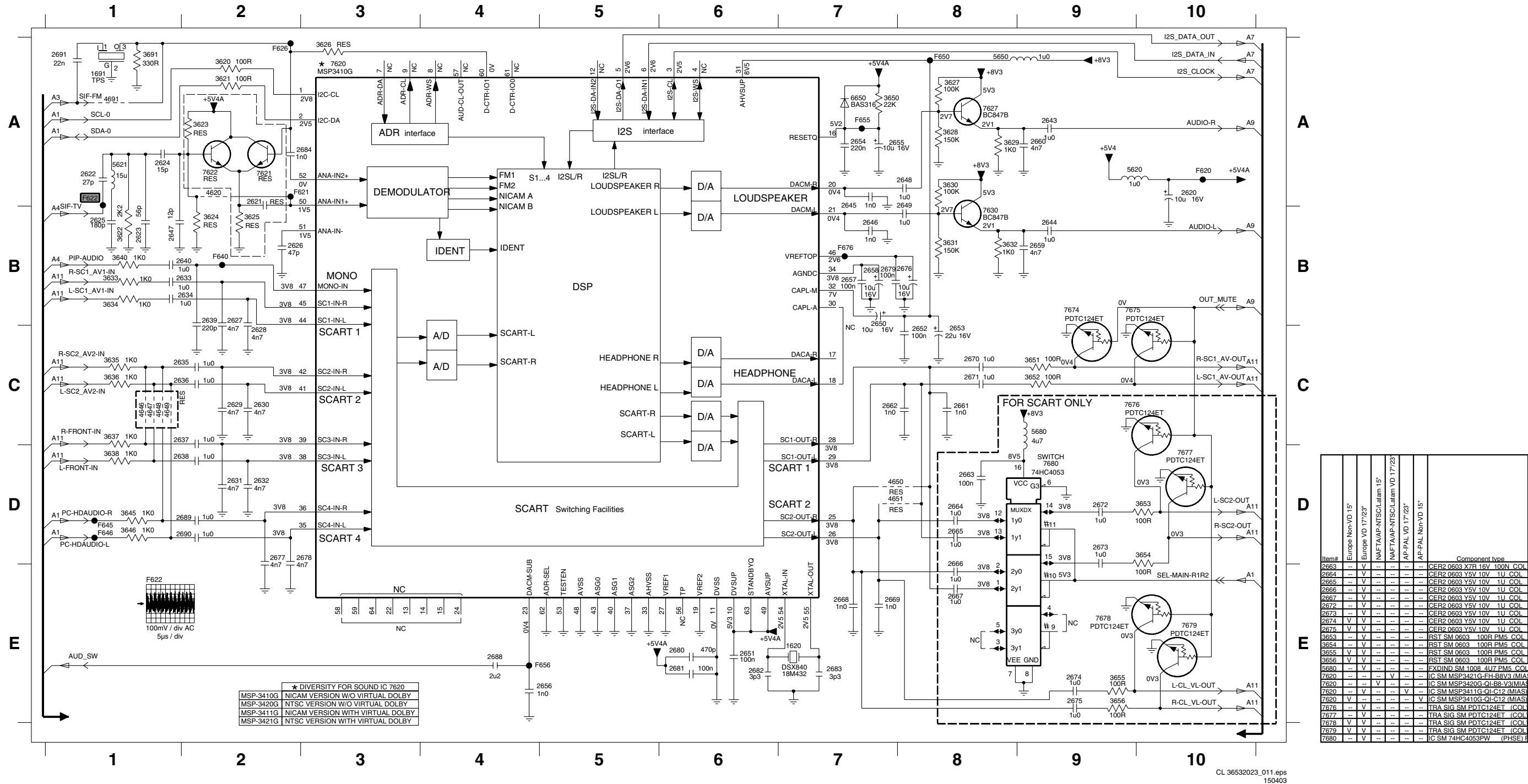
**A 7 AUDIO DELAY LINE  
(COMMON)**


2601 B2  
 2602 D2  
 2603 B2  
 2604 B7  
 2605 B8  
 2610 F6  
 2611 F6  
 2612 D9  
 2613 D9  
 3610 F5  
 3611 F6  
 4601 E2  
 4602 E2  
 4603 F2  
 4604 F2  
 4605 F2  
 4606 F2  
 4610 C9  
 4611 C9  
 4612 C9  
 4613 C9  
 4614 C9  
 4615 C9  
 4616 C9  
 4617 C9  
 5601 A1  
 7601 A1  
 7602 D1  
 7603 A2  
 7604 B7  
 7605 B8  
 7610 F6  
 F601 A1  
 F602 C9  
 F603 D9  
 F610 F9  
 F612 F5  
 F613 F6

## TV Board: Audio Processing

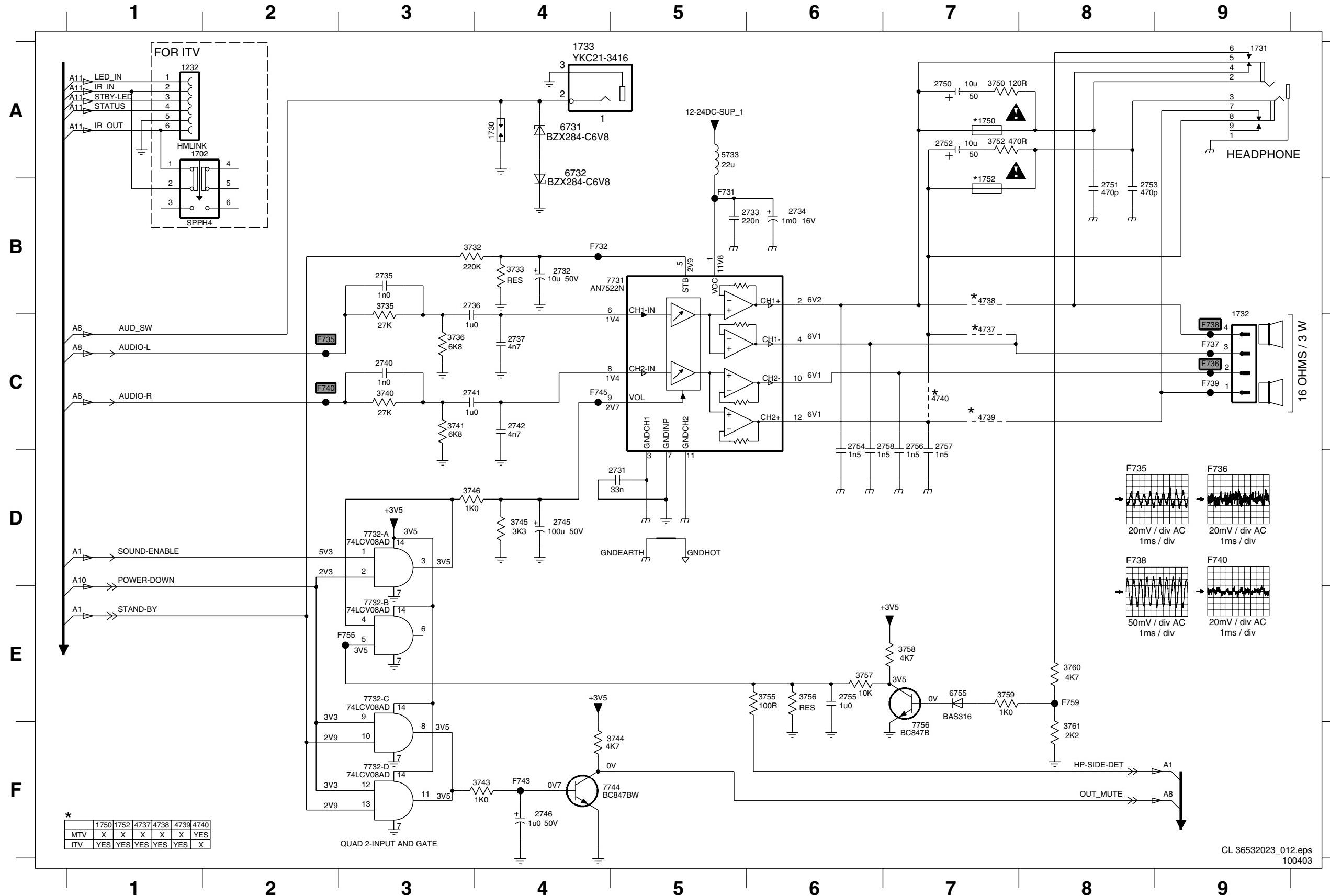
# A 8 AUDIO PROCESSING (COMMON)

1620 E7	2624 A1	2630 C2	2636 C1	2644 B9	2650 C7	2656 E5	2662 C7	2668 E7	2674 E9	2680 E6	2689 D2	3623 A2	3629 A8	3635 C1	3646 D1	3655 E9	4648 C1	5621 A1	7622 A2	7677 D10	F622 A1	F651 A1
1691 A1	2625 B1	2631 D2	2637 C1	2645 B7	2651 E6	2657 B7	2663 D8	2669 E7	2675 E9	2681 E6	2690 D2	3624 B2	3630 A8	3636 C1	3650 A7	3656 E9	4649 C1	5650 A8	7627 A8	7678 E9	F626 A2	F652 A1
2620 A10	2626 B2	2632 D2	2638 D1	2646 B7	2652 C8	2658 B7	2664 D8	2670 C8	2676 B8	2682 E6	2691 A1	3625 B2	3631 B8	3637 C1	3651 C9	3691 A1	4650 D7	5680 C9	7630 B8	7679 E10	F640 B2	F677 A1
2621 A2	2627 B2	2633 B2	2639 B2	2647 B1	2653 B8	2659 B9	2665 D8	2671 C8	2677 D2	2683 E7	3620 A2	3626 A3	3632 B8	3638 D1	3652 C9	4620 A2	4651 D7	6650 A7	7674 B9	7680 D9	F645 D1	
2622 A1	2628 C2	2634 B2	2640 B2	2648 A8	2654 A7	2660 A9	2666 E8	2672 D9	2678 D3	2684 A3	3621 A2	3627 A8	3633 B1	3640 B1	3653 D10	4646 C1	4691 A1	7620 A3	7675 B10	F620 A10	F646 D1	
2623 B1	2629 C2	2635 C1	2643 A9	2649 B8	2655 A7	2661 C8	2667 E8	2673 D9	2679 B7	2688 E4	3622 B1	3628 A8	3634 B1	3645 D10	3654 D10	4647 C1	5620 A9	7621 A2	7676 C10	F621 A3	F650 A8	



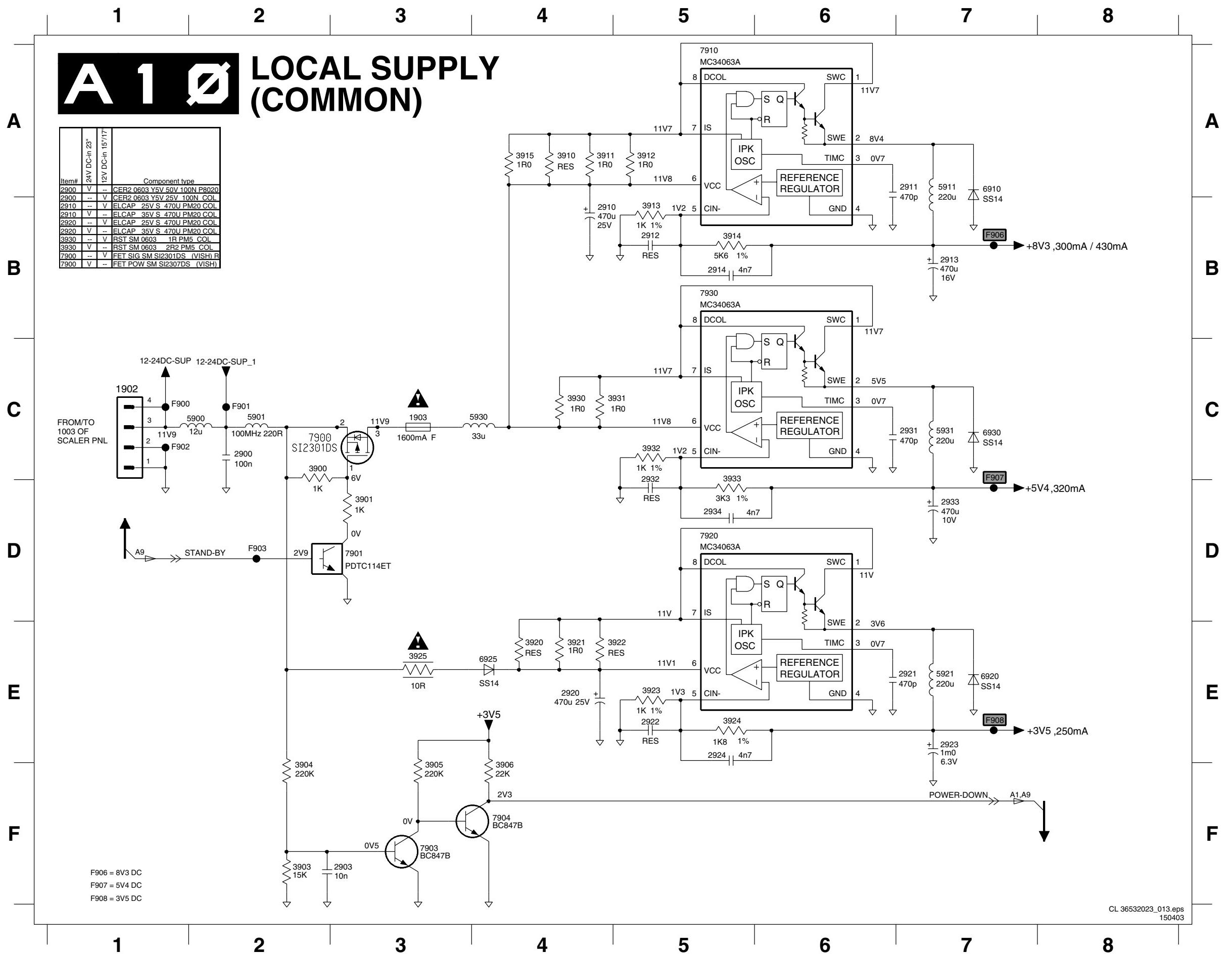
TV Board: Audio Amplifier 2x3 Watts (15"/17")

# A9 AUDIO AMPLIFIER 2x3 Watts (15"/17")



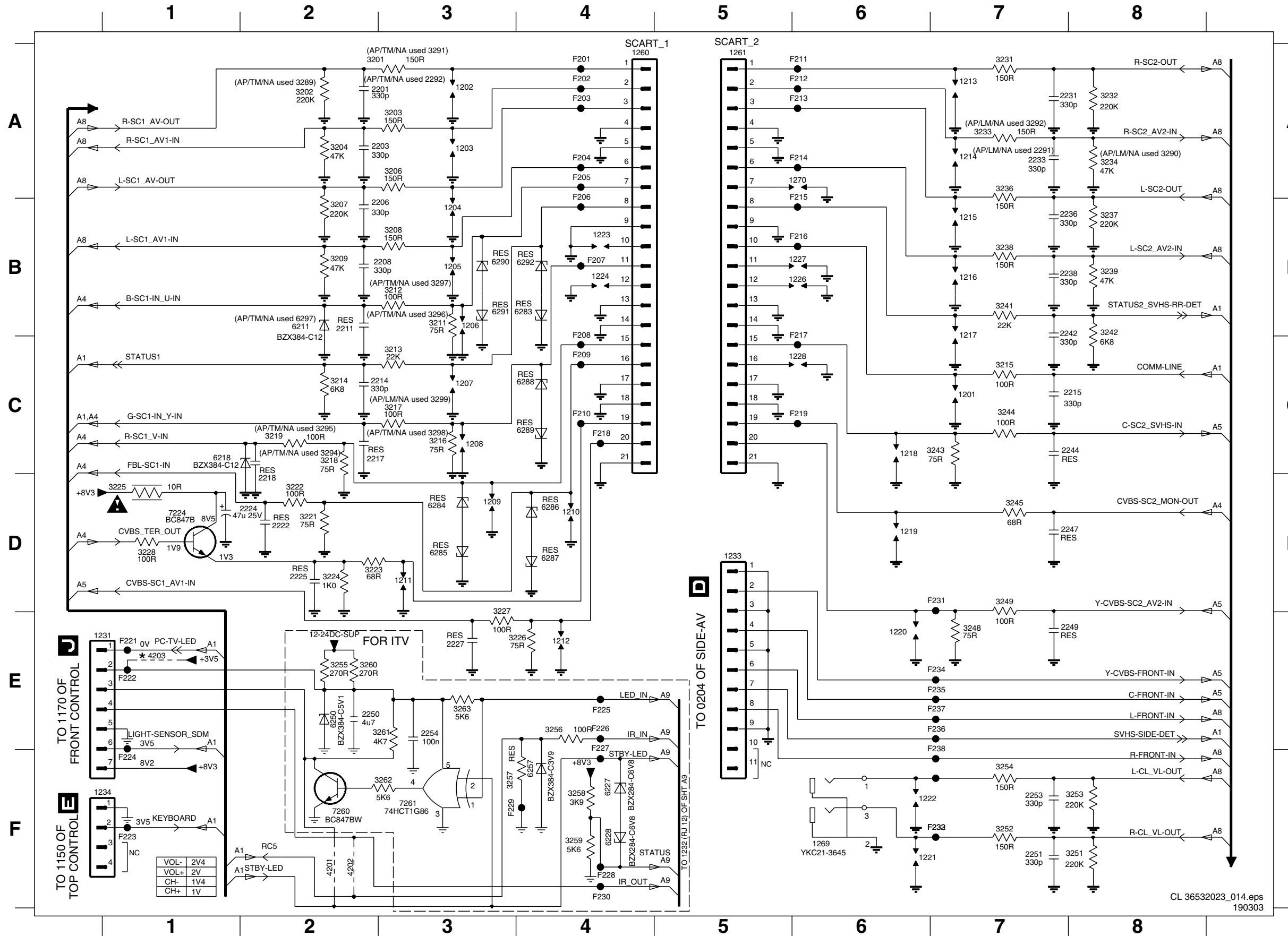
1232 A1  
 1702 A1  
 1730 A4  
 1731 A9  
 1732 B9  
 1733 A4  
 1750 A7  
 1752 B7  
 2731 D5  
 2732 B4  
 2733 B6  
 2734 B6  
 2735 B3  
 2736 B3  
 2737 C4  
 2740 C3  
 2741 C3  
 2742 C4  
 2745 D4  
 2746 F4  
 2750 A7  
 2751 B8  
 2752 A7  
 2753 B8  
 2754 C6  
 2755 E6  
 2756 C7  
 2757 C7  
 2758 C7  
 3732 B3  
 3733 B4  
 3735 B3  
 3736 C3  
 3740 C3  
 3741 C3  
 3743 F4  
 3744 F5  
 3745 D4  
 3746 D3  
 3750 A7  
 3752 A7  
 3755 E6  
 3756 E6  
 3757 E6  
 3758 E7  
 3759 E7  
 3760 E8  
 3761 F8  
 4737 C7  
 4738 B7  
 4739 C7  
 4740 C7  
 5733 A5  
 6731 A4  
 6732 A4  
 6755 E7  
 7731 B5  
 7732-A D3  
 7732-B E3  
 7732-C E3  
 7732-D F3  
 7744 F4  
 7756 F7  
 F731 B5  
 F732 B4  
 F735 C2  
 F736 C9  
 F737 C9  
 F738 C9  
 F739 C9  
 F740 C2  
 F743 F4  
 F745 C4  
 F755 E3  
 F759 E8

## TV Board: Local Supply

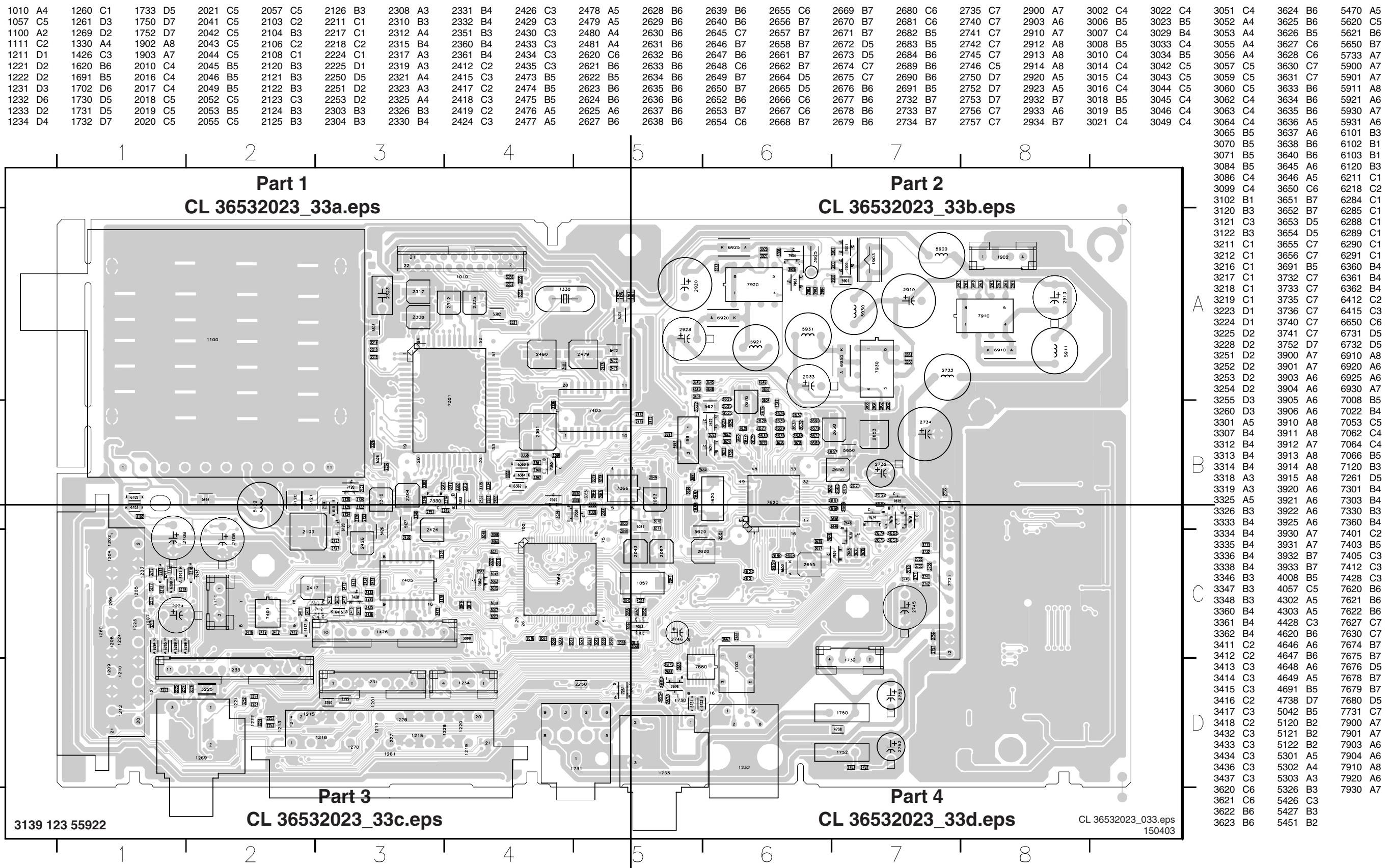


**TV Board: SCART I/O (15"/17"/23")**

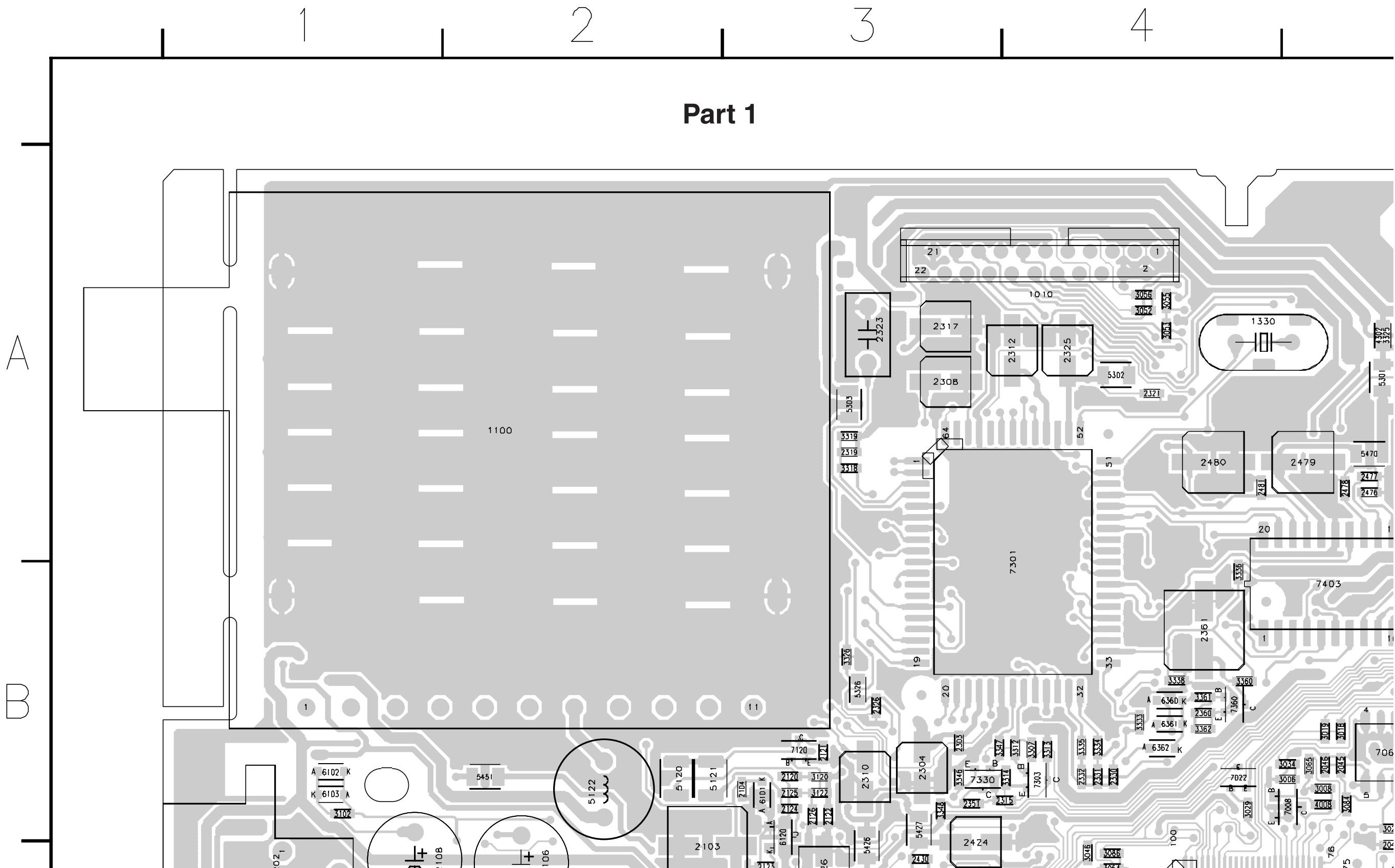
# A 1 1 SCART IO (15"/17"/23" SCART)



1201 C7	3231 A7	F236 E7
1202 A3	3232 A8	F237 E7
1203 A3	3233 A7	F238 F7
1204 B3	3234 A8	
1205 B3	3236 A7	
1206 B3	3237 B8	
1207 C3	3238 B7	
1208 C3	3239 B8	
1209 D3	3241 B7	
1210 D4	3242 B8	
1211 D3	3243 C7	
1212 E4	3244 C7	
1213 A7	3245 D7	
1214 A7	3248 E7	
1215 B7	3249 D7	
1216 B7	3251 F8	
1217 C7	3252 F7	
1218 C6	3253 F8	
1219 D6	3254 F7	
1220 E6	3255 E2	
1221 F6	3256 E4	
1222 F6	3257 F3	
1223 B4	3258 F4	
1224 B4	3259 F4	
1226 B6	3260 E2	
1227 B6	3261 E3	
1228 C6	3262 F3	
1231 E1	3263 E3	
1233 D5	4201 F2	
1234 F1	4202 F2	
1260 A4	4203 E1	
1261 A5	6211 B2	
1269 F6	6218 C1	
1270 A6	6227 F4	
2201 A3	6228 F4	
2203 A3	6250 E2	
2206 B3	6257 F4	
2208 B3	6283 B4	
2211 B2	6284 D3	
2214 C3	6285 D3	
2215 C8	6286 D4	
2217 C2	6287 D4	
2218 C2	6288 C4	
2222 D2	6289 C4	
2224 D2	6290 B3	
2225 D2	6291 B3	
2227 E3	6292 B4	
2231 A8	7224 D1	
2233 A8	7260 F2	
2236 B8	7261 F3	
2238 B8	F201 A4	
2242 B8	F202 A4	
2244 C8	F203 A4	
2247 D8	F204 A4	
2249 E8	F205 A4	
2250 E2	F206 B4	
2251 F7	F207 B4	
2253 F7	F208 C4	
2254 E3	F209 C4	
3201 A2	F210 C4	
3202 A2	F211 A6	
3203 A3	F212 A6	
3204 A2	F213 A6	
3206 A3	F214 A6	
3207 B2	F215 B6	
3208 B3	F216 B6	
3209 B2	F217 C6	
3211 B3	F218 C4	
3212 B3	F219 C6	
3213 C3	F221 E1	
3214 C2	F222 E1	
3215 C7	F223 F1	
3216 C3	F224 F1	
3217 C3	F225 E4	
3218 C2	F226 E4	
3219 C2	F227 F4	
3221 D2	F228 F4	
3222 D2	F229 F3	
3223 D2	F230 F4	
3224 D2	F231 D7	
3225 D1	F232 F7	
3226 E4	F233 F7	
3227 E3	F234 E7	
3228 D1	F235 E7	

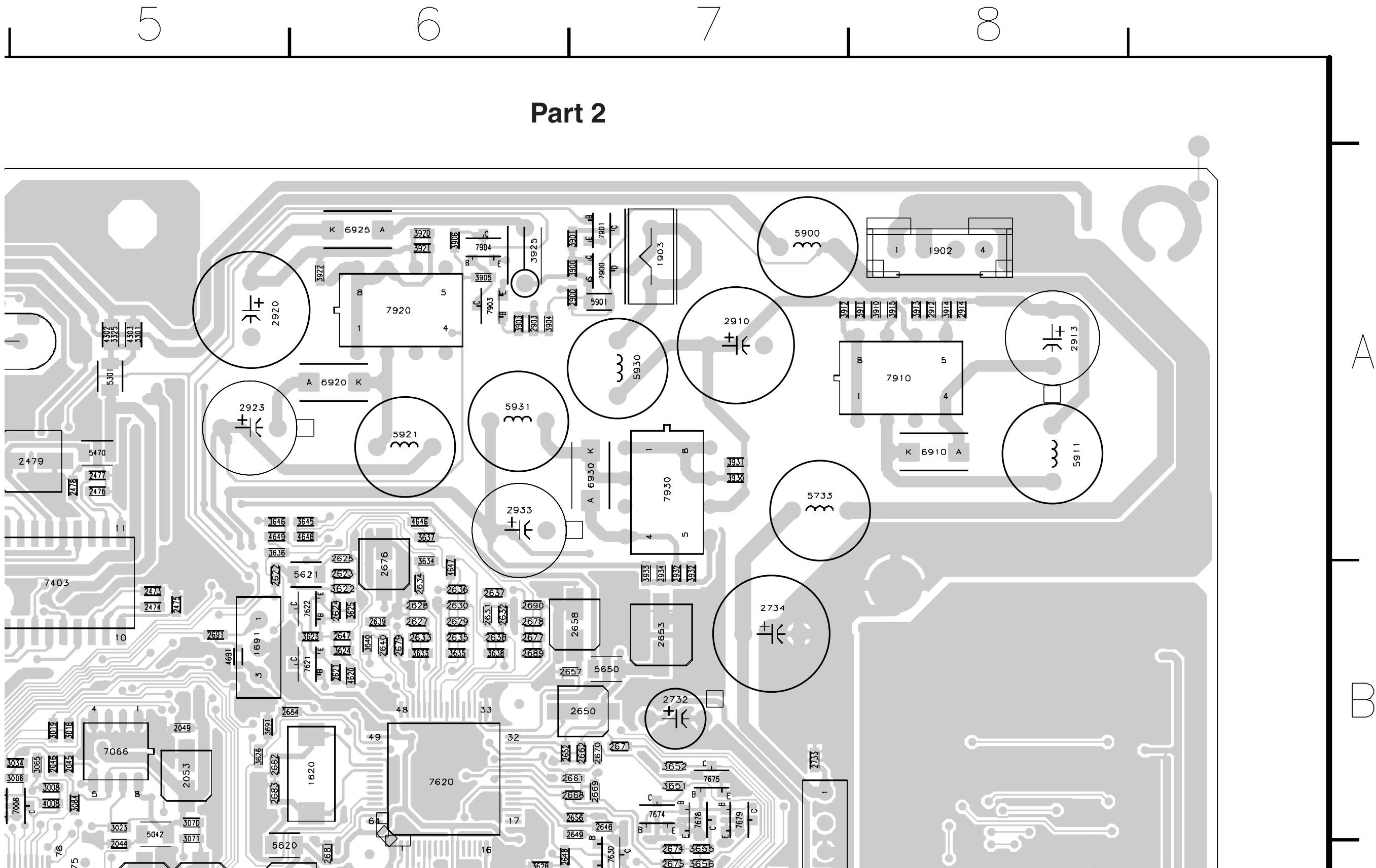
**Layout TV Board (Overview Top Side)**

## **Layout TV Board (Part 1 Top Side)**



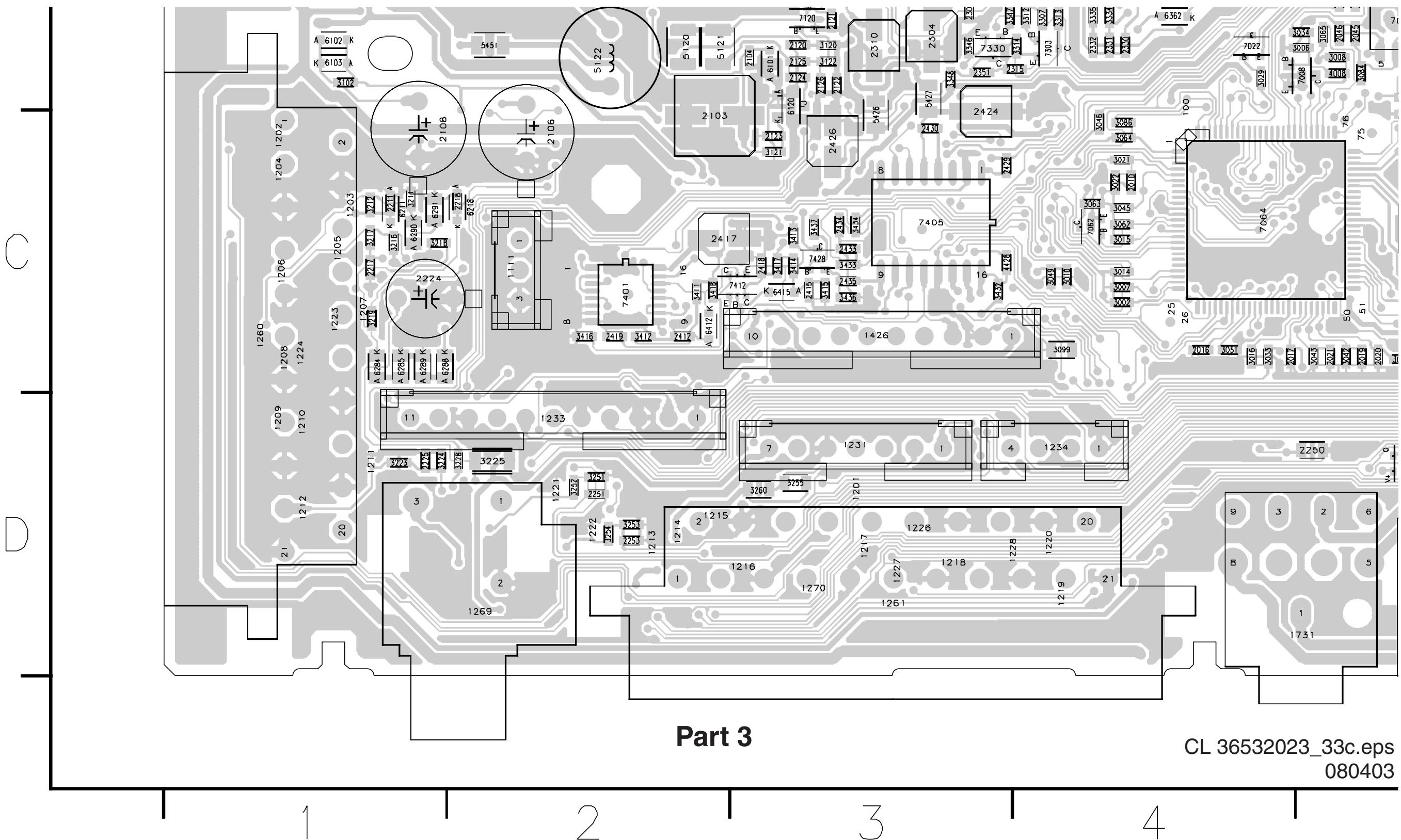
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080403

## **Layout TV Board (Part 2 Top Side)**

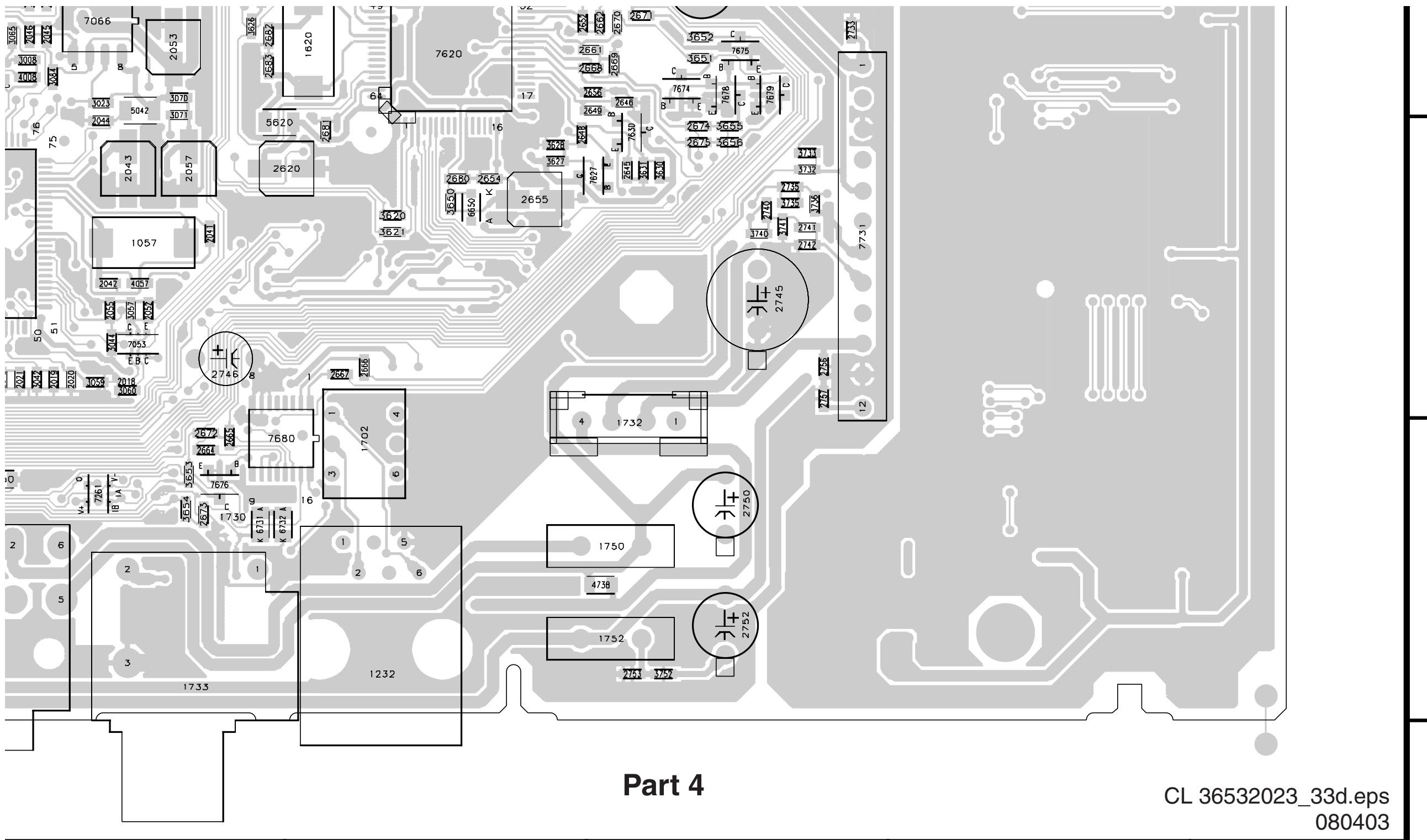


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## Layout TV Board (Part 3 Top Side)



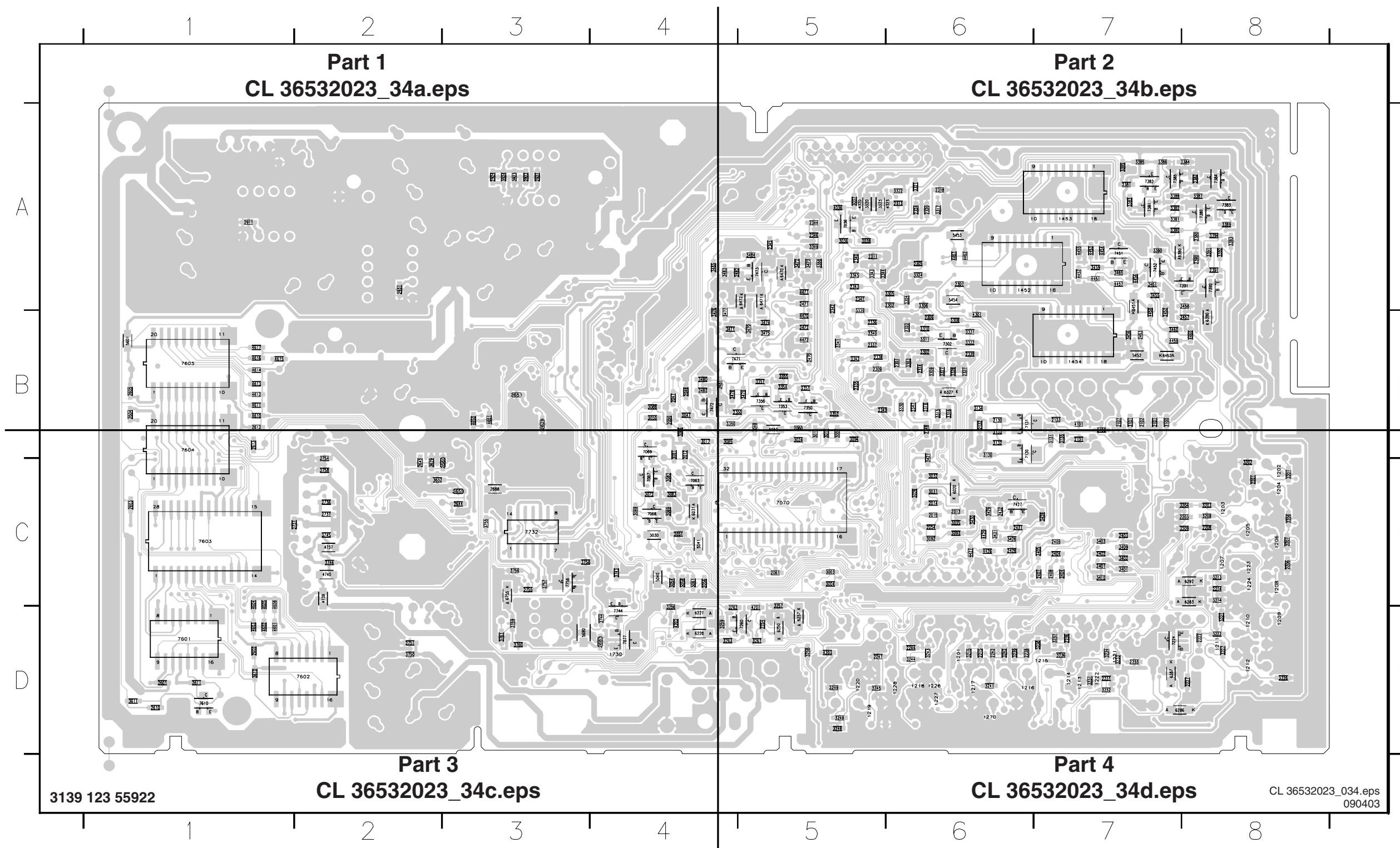
## **Layout TV Board (Part 4 Top Side)**



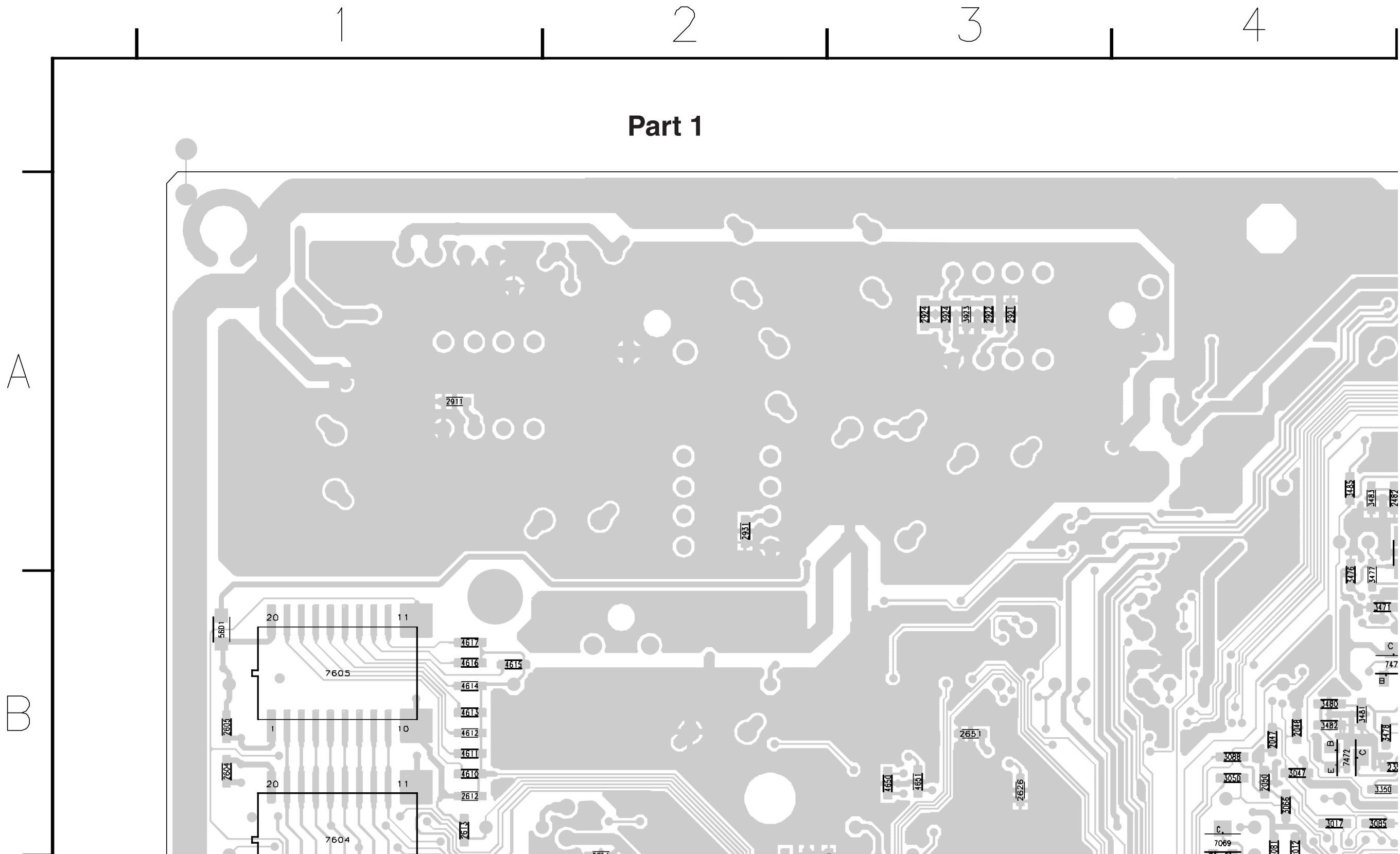
## Part 4

Layout TV Board ( Overview Bottom Side)

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1202	C8	1216	D6	1454	B7	2101	B7	2222	D8	2305	A6	2335	B5	2348	B6	2407	C7	2603	C1	2663	D4	2931	A2	3036	A5	3081	B4	3132	B6	3214	C8	3239	D6	3262	D4	3317	A6	3341	B5	3380	A7	3393	A8	3429	C6	3472	A5	3485	A4	6250	D5
1203	C8	1217	D6	2012	B4	2102	B7	2227	D8	2306	B6	2336	B5	2349	B5	2408	C7	2604	B1	2688	C3	3003	C5	3037	A5	3082	C4	3133	B6	3215	D6	3241	D6	3263	D4	3320	A5	3342	B5	3381	A7	3394	A8	3430	C6	3473	A5	3610	D1	6257	D5
1204	C8	1218	D6	2013	C6	2107	B7	2231	D7	2307	A6	2337	B5	2350	B4	2428	C6	2605	B1	2731	C2	3004	C5	3038	A5	3083	C4	3134	B6	3221	D8	3242	D6	3302	B6	3321	A6	3343	A5	3382	A7	3395	A7	3431	C6	3474	B5	3611	D1	6283	C8
1205	C8	1219	D5	2014	C6	2130	B6	2233	D7	2309	B5	2338	B5	2380	A8	2431	C6	2610	D1	2736	C2	3009	B5	3047	B4	3085	B4	3135	B7	3222	D8	3243	D6	3303	B6	3322	A6	3344	A5	3383	A7	3401	C7	3455	A7	3475	B5	3629	C2	6286	D7
1206	C8	1220	D5	2015	C6	2131	B7	2236	D7	2311	A5	2339	B6	2381	A7	2432	C6	2611	D1	2737	C2	3012	B5	3048	B4	3088	B4	3201	C8	3226	D8	3244	D6	3304	A6	3323	A5	3345	A5	3384	B4	3402	C7	3456	B7	3476	B4	3632	C2	6287	D7
1207	C8	1223	C8	2047	B4	2132	B6	2238	D6	2313	A6	2340	A5	2382	A8	2452	B7	2612	B1	2751	D2	3013	B5	3050	B4	3092	C6	3202	C8	3227	D8	3245	D5	3305	A6	3324	A6	3349	A5	3385	A7	3403	C7	3457	B8	3477	B4	3743	C4	6292	C8
1208	C8	1224	C8	2048	B4	2133	B7	2242	D6	2314	B6	2341	A5	2390	A8	2453	B7	2613	B1	2754	C2	3017	B4	3054	C4	3093	C6	3203	C8	3231	D7	3248	D5	3306	A6	3327	B6	3350	B4	3386	A7	3404	C7	3458	A8	3478	B4	3744	D4	6327	B6
1209	D8	1226	D6	2050	B4	2201	C8	2244	D6	2316	B6	2342	A5	2391	A8	2470	B5	2626	B3	2755	C3	3024	B5	3058	C4	3094	B5	3204	C8	3232	D7	3249	D5	3308	B6	3328	B6	3351	B5	3387	A8	3405	C7	3459	A7	3479	B5	3745	C2	6380	A7
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1213	D7	1270	D6	2056	C4	2208	C8	2254	D5	2322	B6	2345	A5	2403	C7	2482	A4	2651	B3	2921	A3	3031	C6	3068	C4	3103	B7	3208	C8	3236	D7	3258	D5	3311	B6	3332	B6	3355	B5	3390	A7	3426	C6	3465	A7	3482	B4	3755	C3	6452	B7
1214	D7	1452	A6	2060	B5	2214	C8	2301	B6	2324	A6	2346	A5	2404	C7	2601	D1	2659	C3	2922	A3	3032	C6	3069	C4	3130	B6	3209	C8	3237	D7	3259	D4	3315	B6	3339	B5	3357	B5	3391	A8	3427	B6	3470	B5	3483	A4	3756	C3	6470	A5

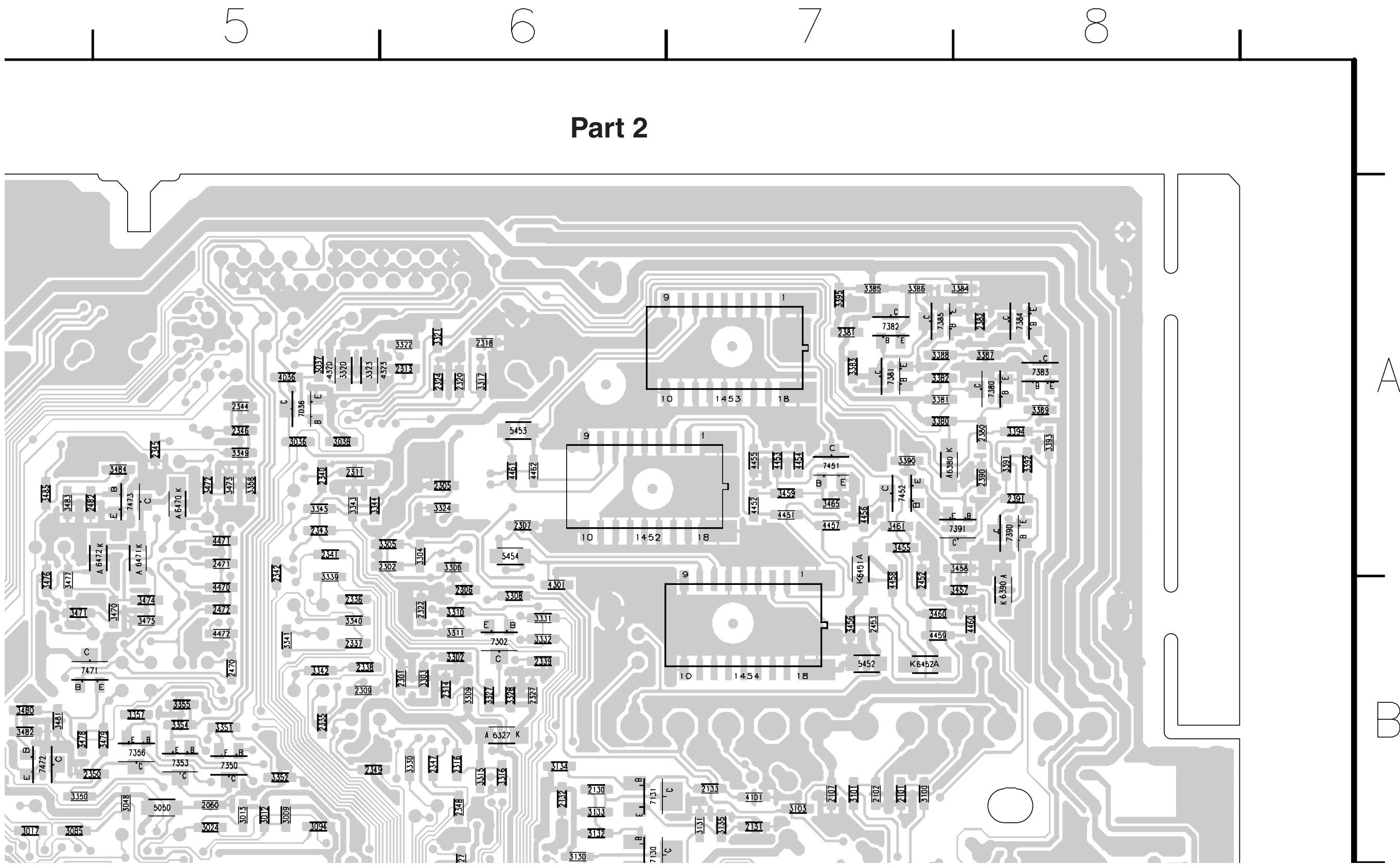


## **Layout TV Board (Part1 Bottom Side)**



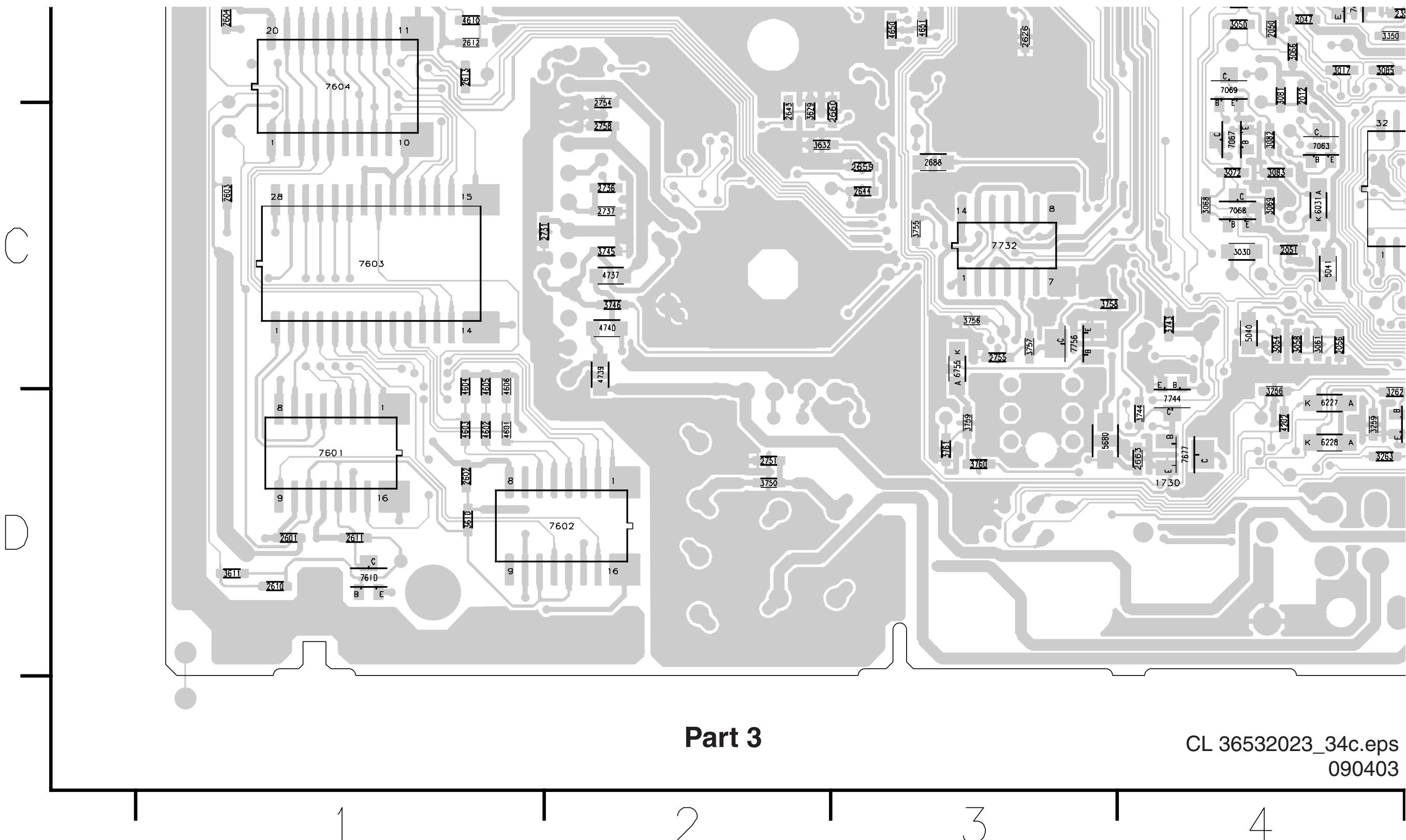
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## **Layout TV Board (Part 2 Bottom Side)**

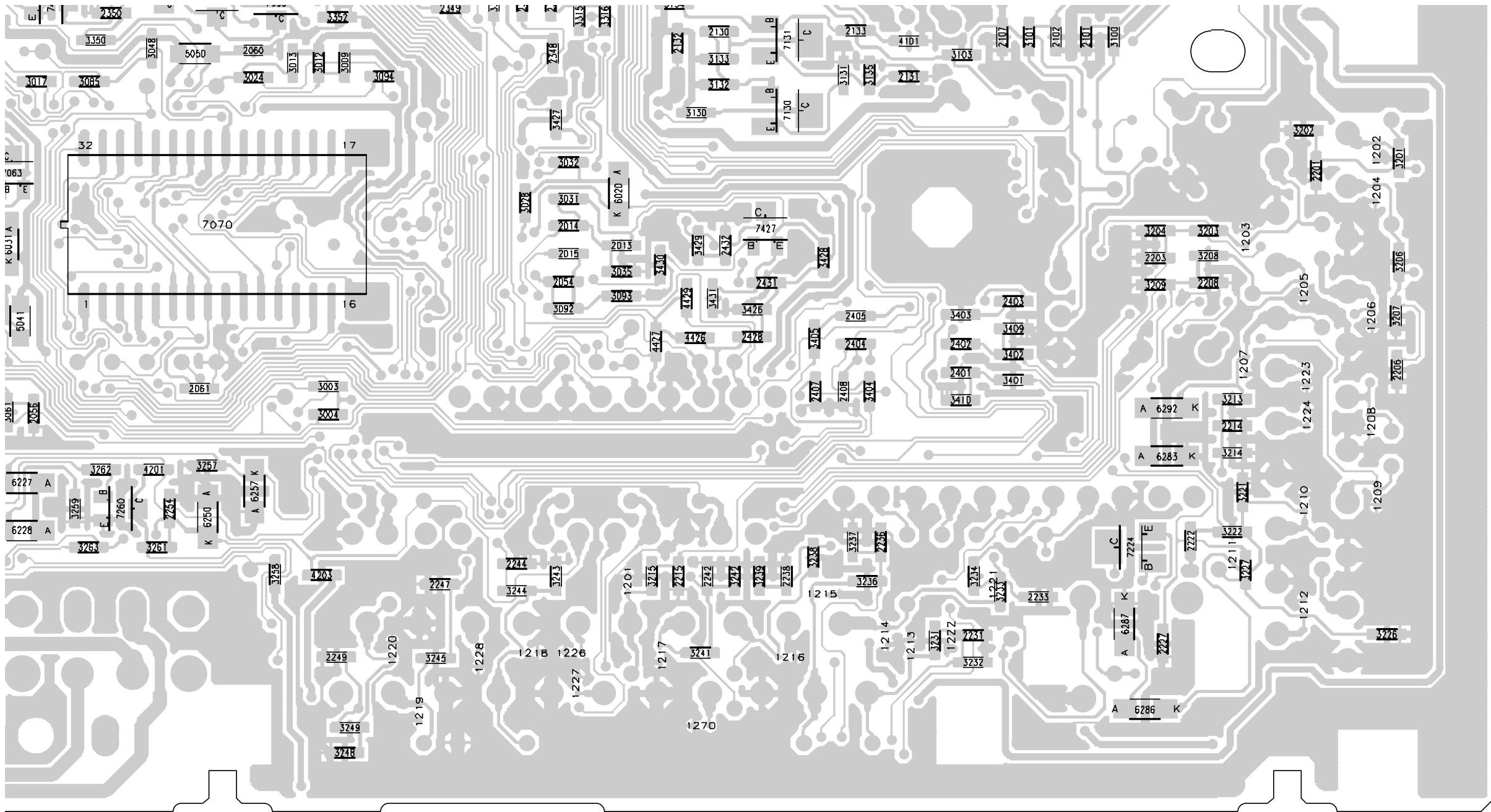


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090403

## Layout TV Board (Part 3 Bottom Side)



## **Layout TV Board (Part 4 Bottom Side)**



## Part 4

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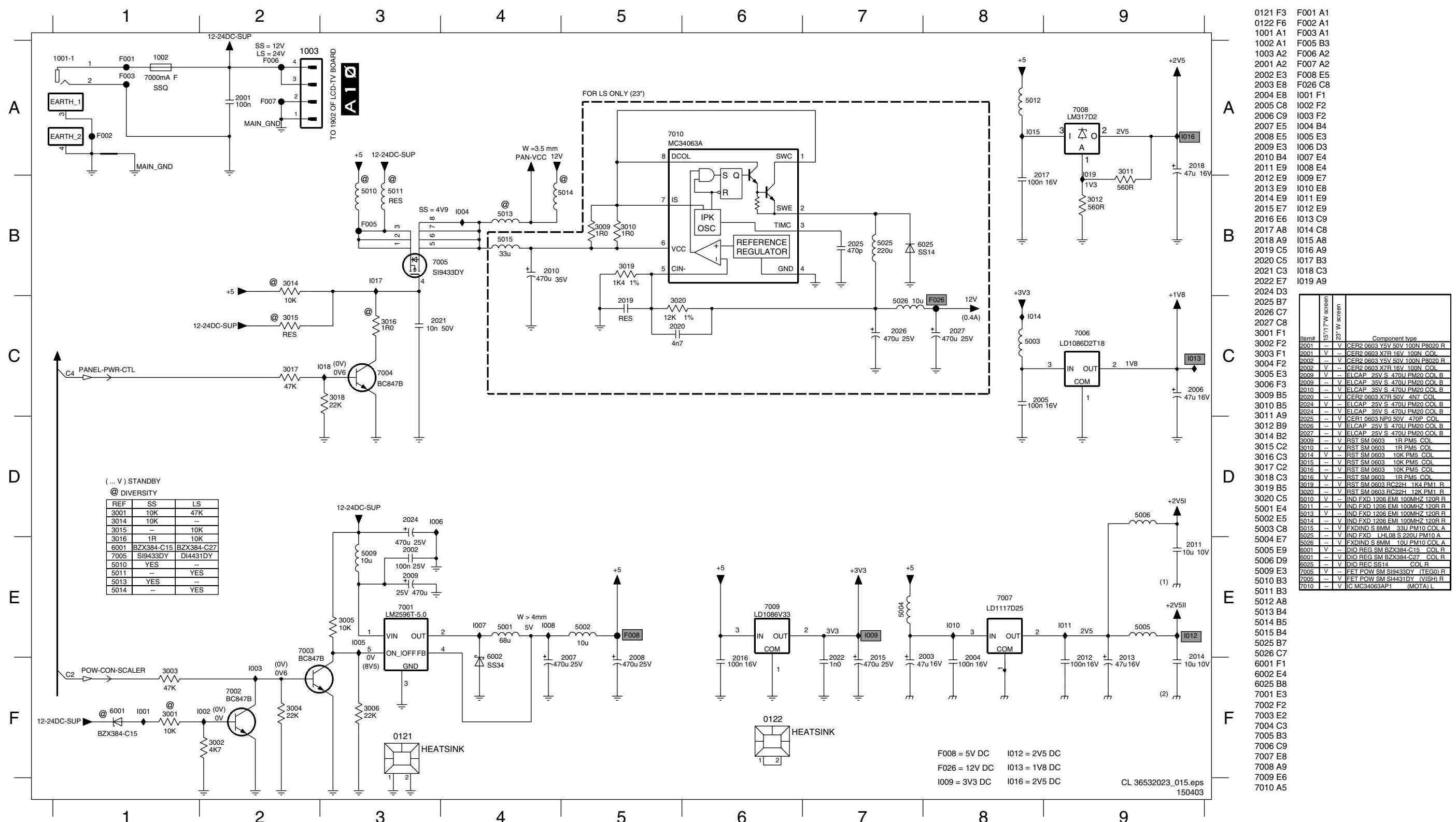
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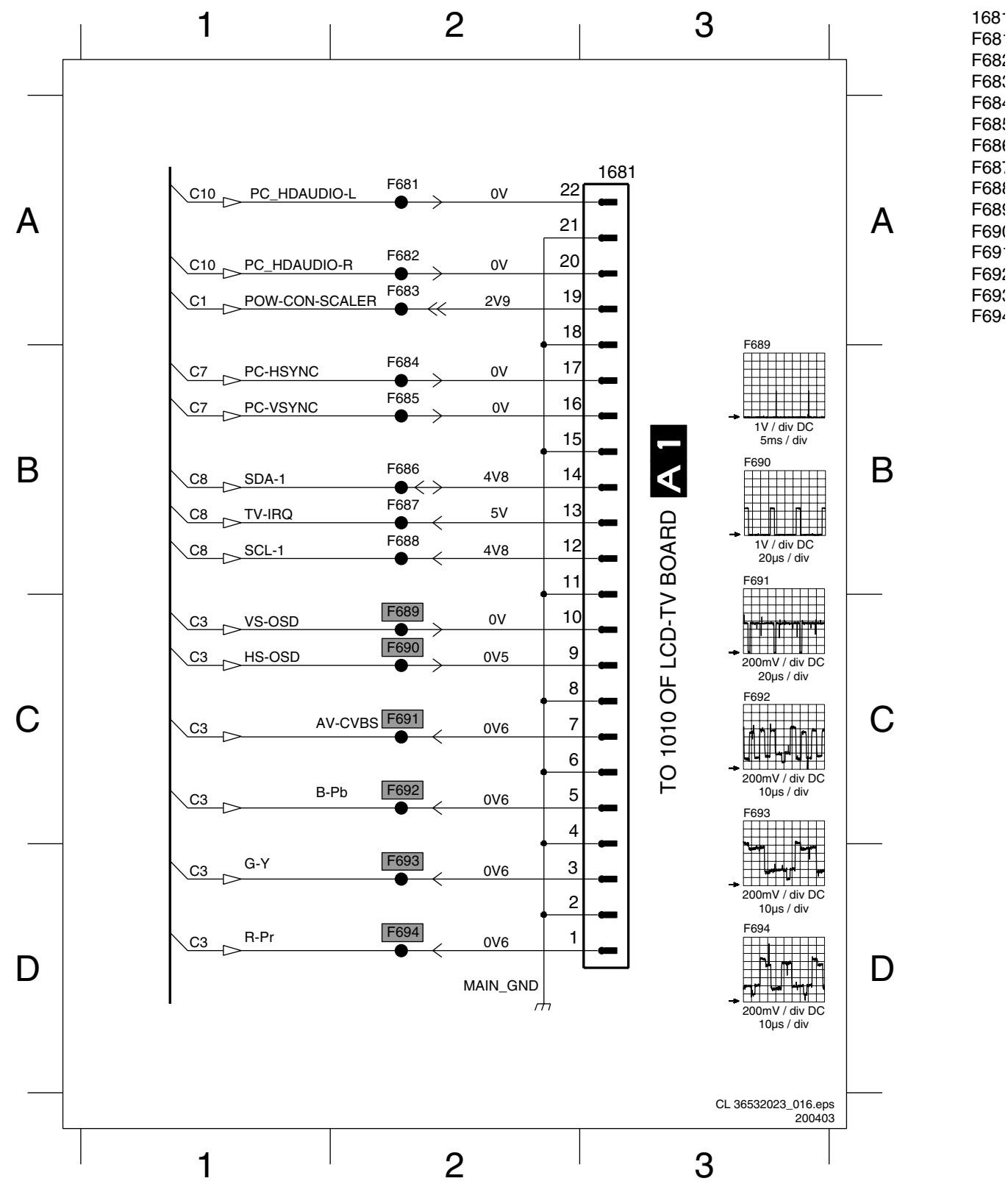
## Scaler Panel: Power

## C 1 POWER



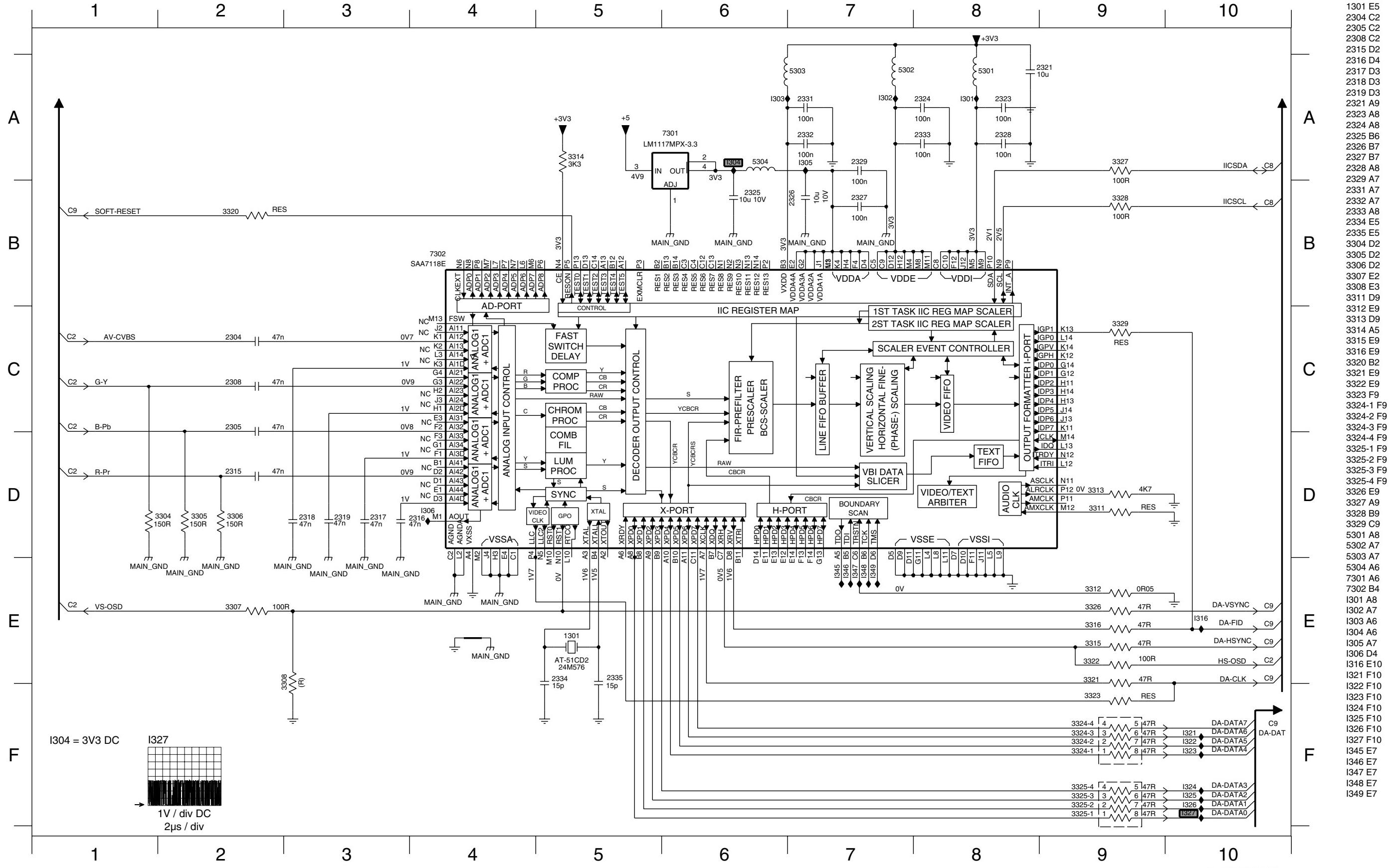
## Scaler Panel: I/O &amp; Interface

# C 2 I/O & INTERFACE

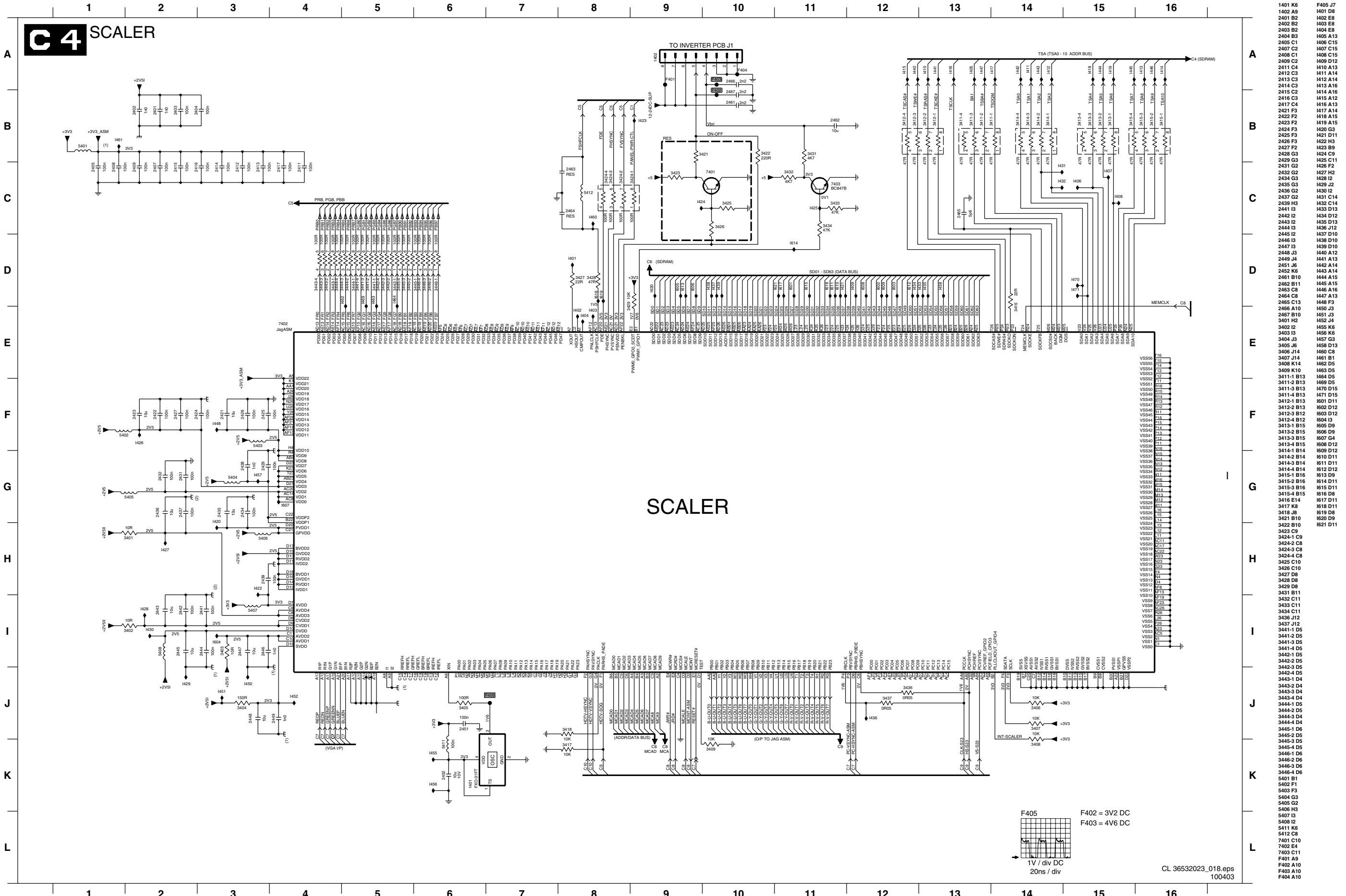
**Personal Notes:**168·  
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F69·  
F69·  
F69·  
F69·F689  
1V / div DC  
5ms / divF690  
1V / div DC  
20μs / divF691  
200mV / div DC  
20μs / divF692  
200mV / div DC  
10μs / divF693  
200mV / div DC  
10μs / divF694  
200mV / div DC  
10μs / div

## Scaler Panel: Video Decoder

# C3 VIDEO DECODER

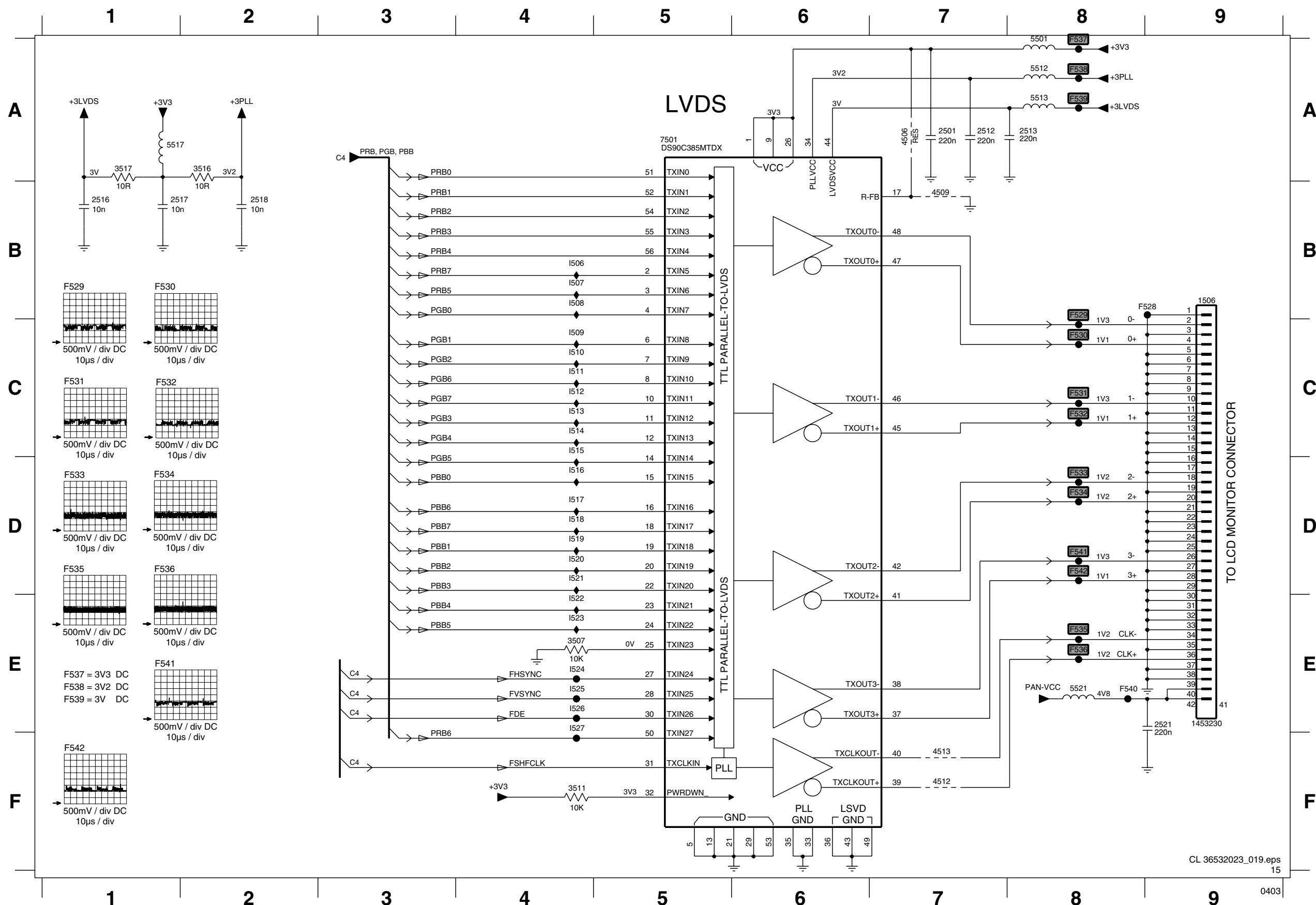


## Scaler Panel: Scaler



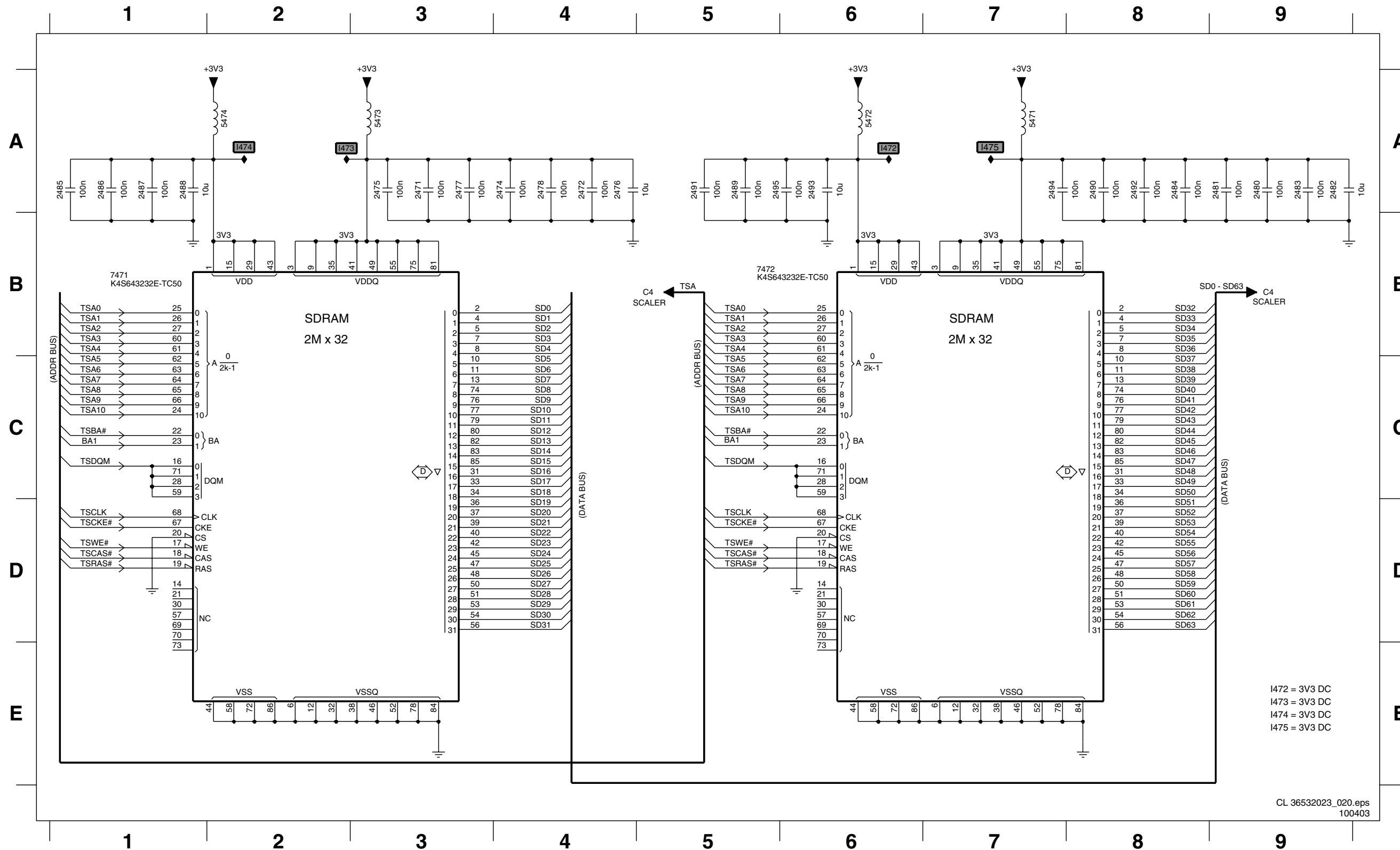
## **Scaler Panel: Outputs (LVDS)**

## C5 OUTPUT (LVDS)

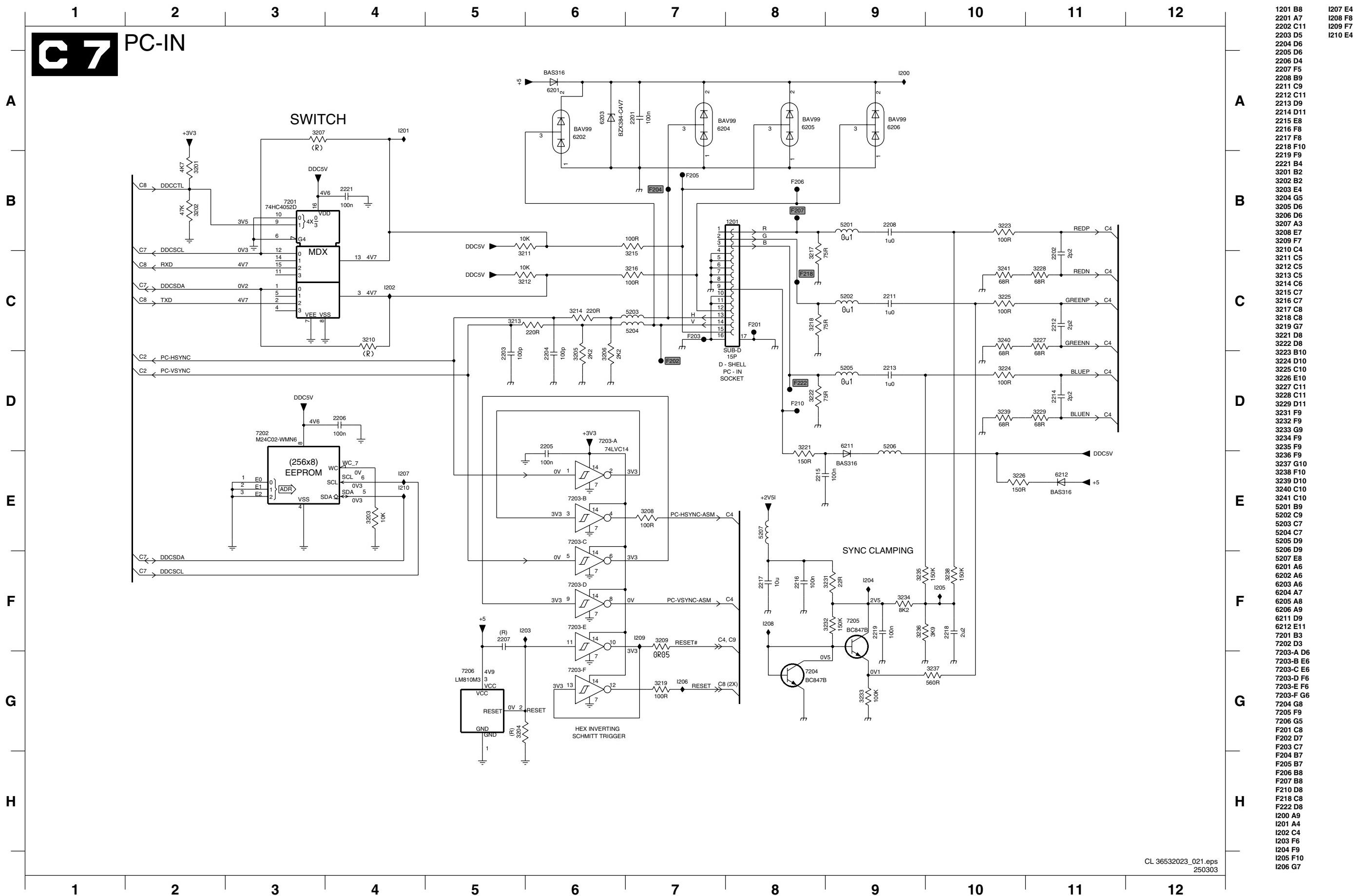


1506 B9  
2501 A7  
2512 A7  
2513 A8  
2516 B1  
2517 B1  
2518 B2  
2521 E9  
3507 E4  
3511 F4  
3516 A5  
3517 A1  
4506 A7  
4509 B7  
4512 F7  
4513 F7  
5501 A8  
5512 A8  
5513 A8  
5517 A1  
5521 E8  
7501 A5  
F528 B9  
F529 B8  
F530 C8  
F531 C8  
F532 C8  
F533 D8  
F534 D8  
F535 E8  
F536 E8  
F537 A8  
F538 A8  
F539 A8  
F540 E8  
F541 D8  
F542 D8  
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I507 B4  
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I527 E4

## Scaler Panel: SDRAM (Scaler)

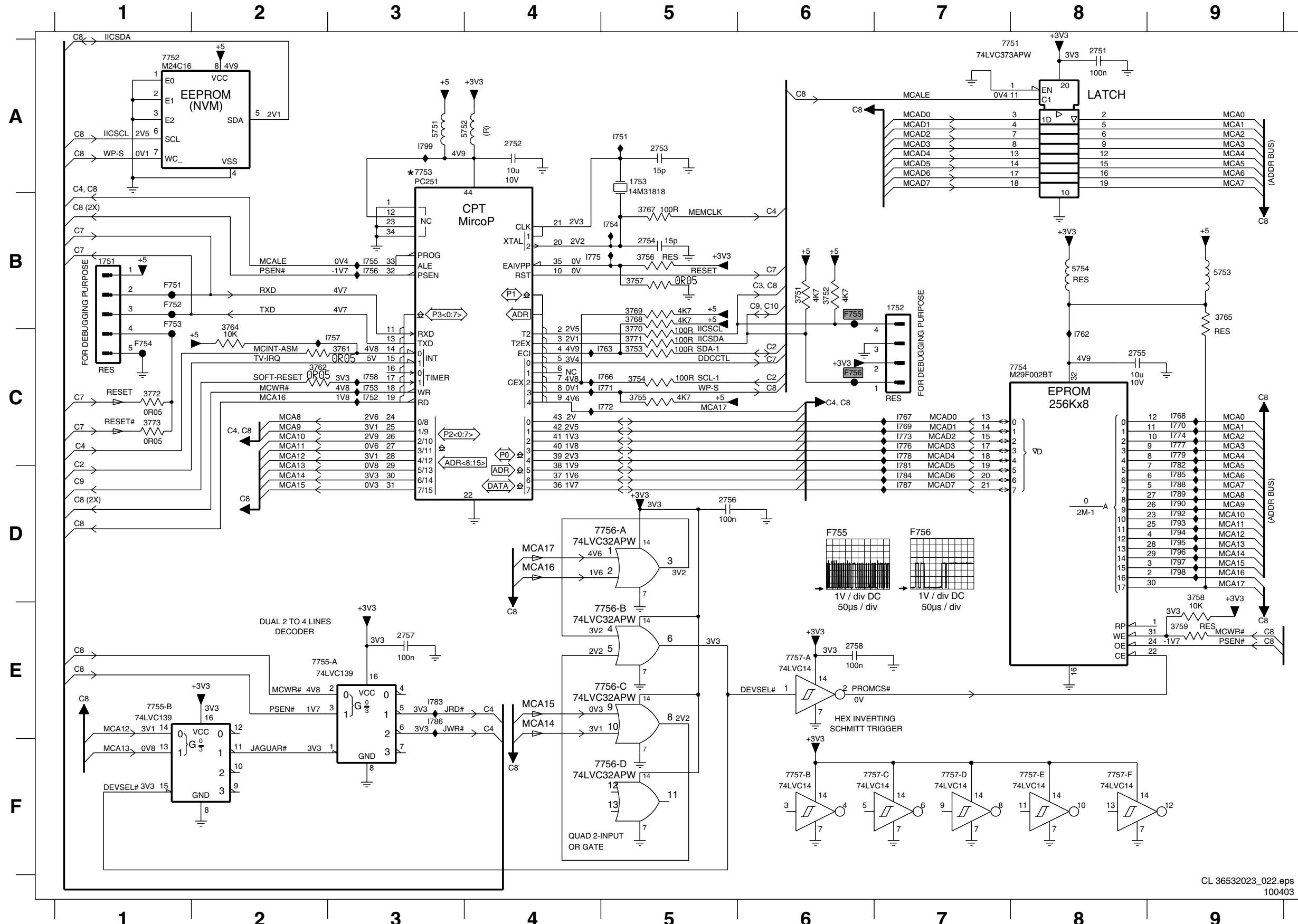
**C 6 SDRAM (SCALER)**

## Scaler Panel: PC-In



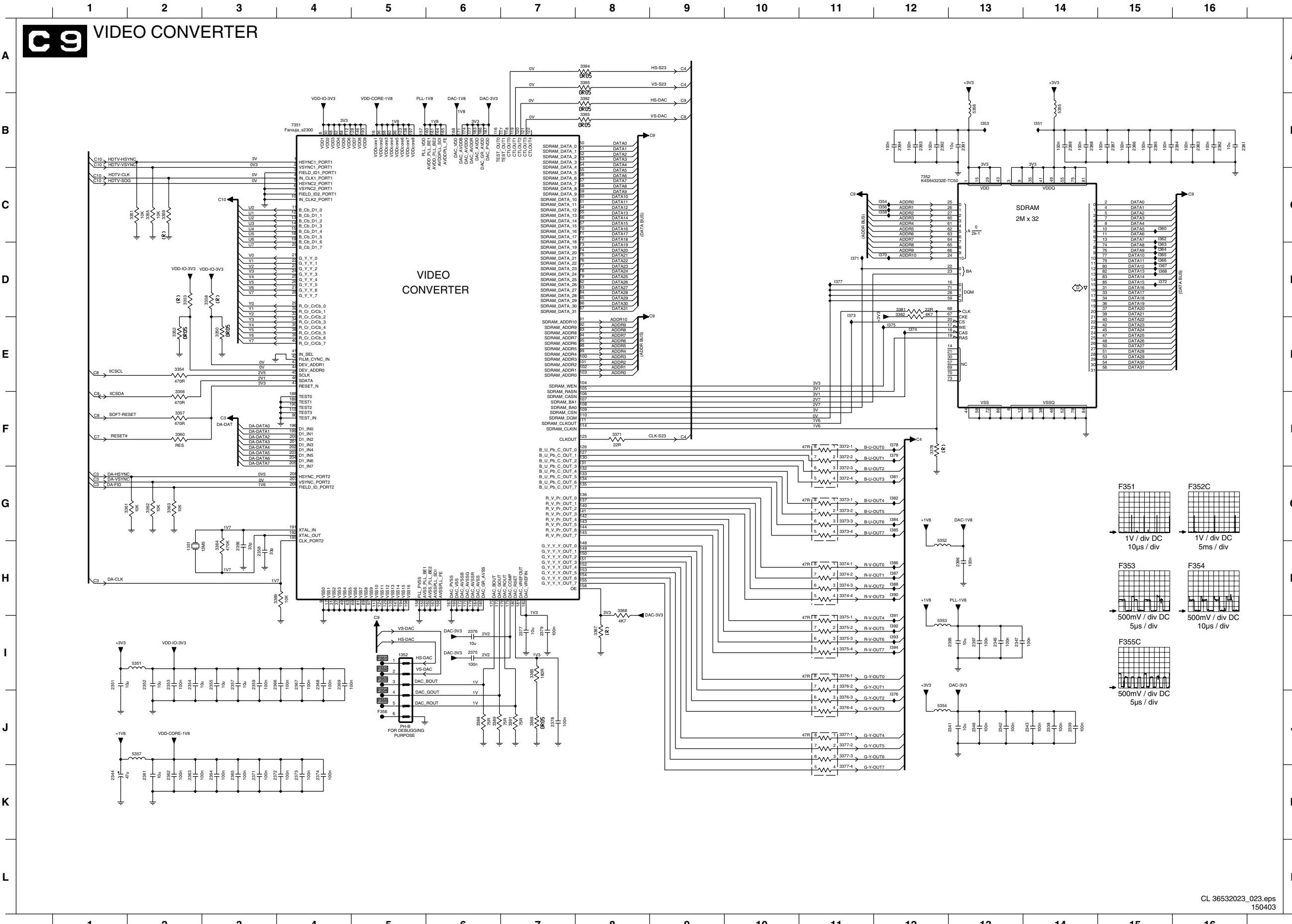
## Scaler Panel: uP

**C8** uP



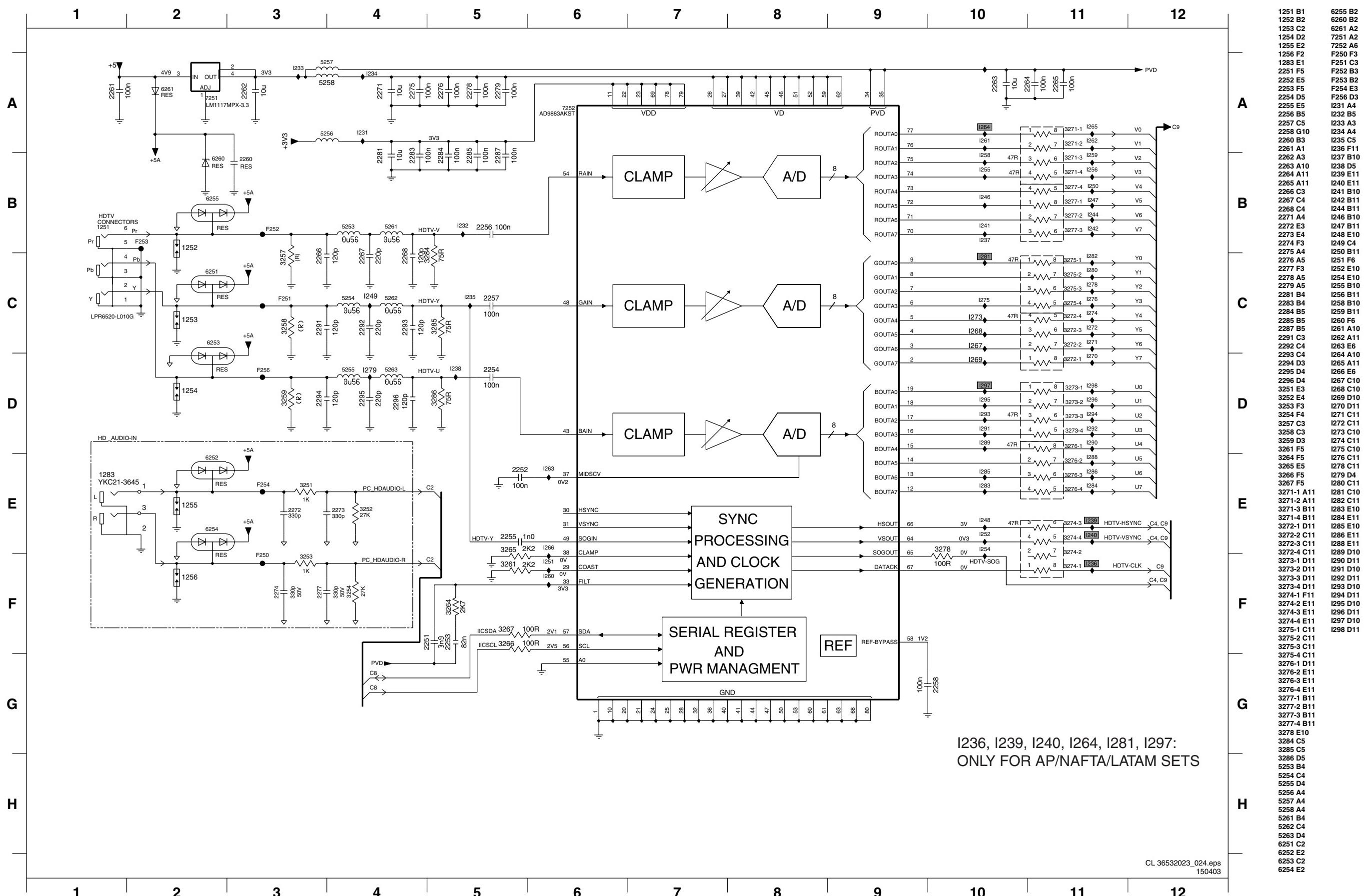
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2751 A8	I778 C7
2752 A4	I779 C9
2753 A5	I781 C7
2754 B5	I782 C9
2755 C8	I783 E3
2756 D5	I784 D7
2757 E3	I785 D9
2758 E6	I786 E3
3751 B6	I787 D7
3752 B6	I788 D9
3753 C5	I789 D9
3754 C5	I790 D9
3755 C5	I792 D9
3756 B5	I793 D9
3757 B5	I794 D9
3758 D9	I795 D9
3759 E9	I796 D9
3761 C3	I797 D9
3762 C2	I798 D9
3764 C2	I799 A3
3765 B9	
3767 B5	
3768 B5	
3769 B5	
3770 C5	
3771 C5	
3772 C1	
3773 C1	
5751 A3	
5752 A4	
5753 B9	
5754 B8	
5755 A7	
7752 A2	
7753 A3	
7754 C7	
7755-A E2	
7755-B E1	
7756-A D5	
7756-B E5	
7756-C E5	
7756-D F5	
7757-A E6	
7757-B F6	
7757-C F6	
7757-D F7	
7757-E F8	
7757-F F8	
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F754 C1	
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I773 C7	
I774 C9	

# **Scaler Panel: Video Converter**



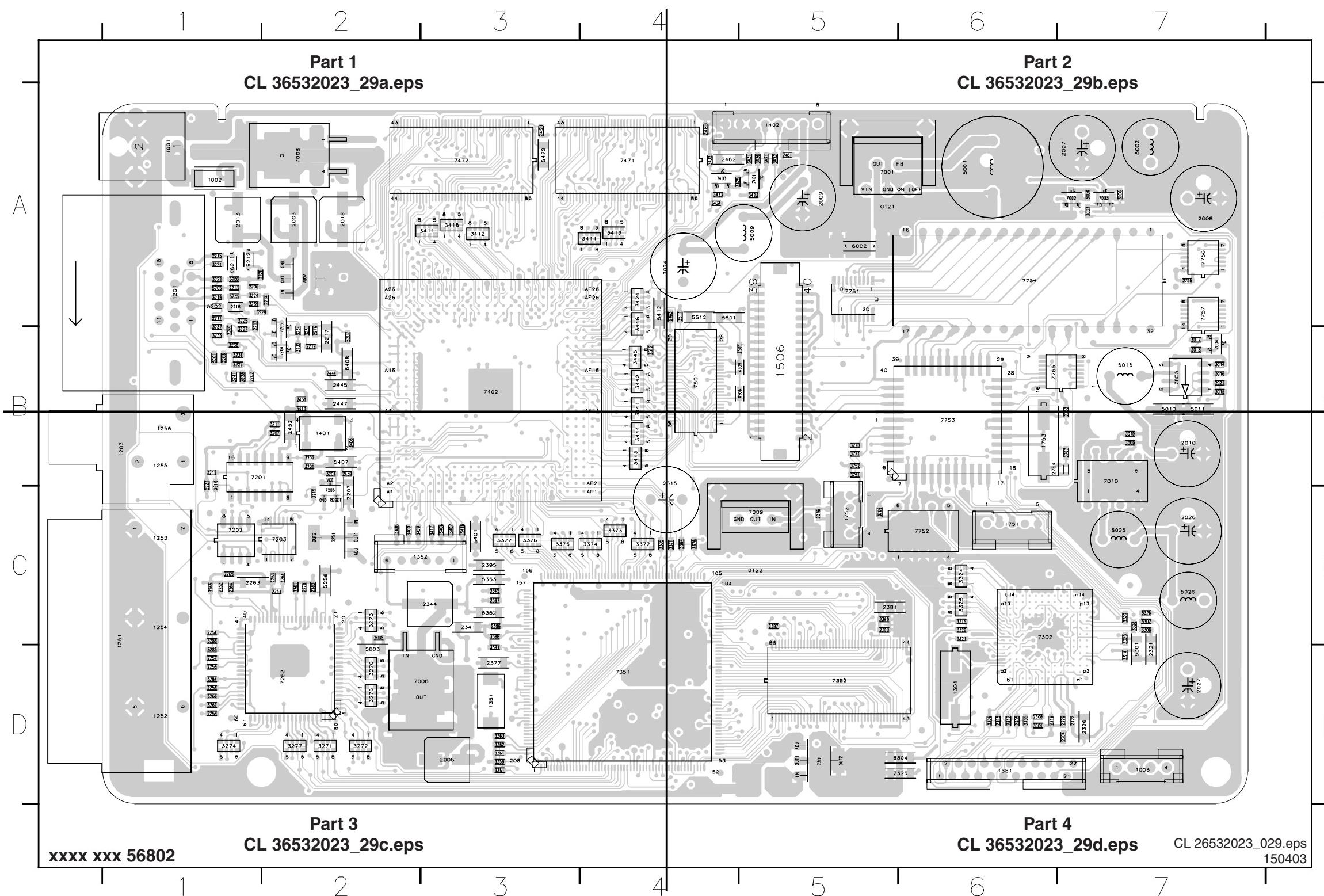
## Scaler Panel: HDTV Decoder

# C 1 Ø HDTV - DECODER

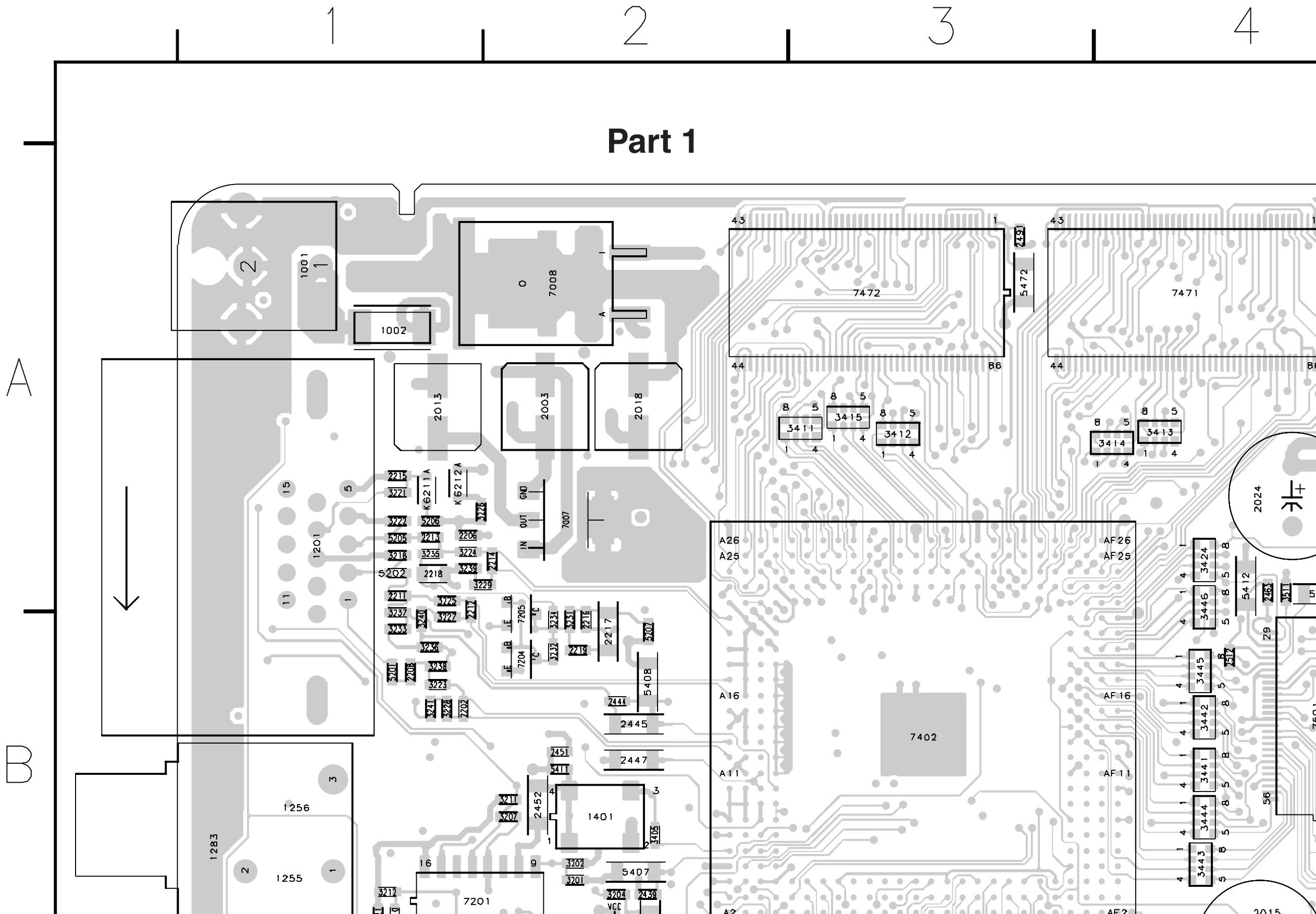


## Layout Scaler Panel (Overview Top Side)

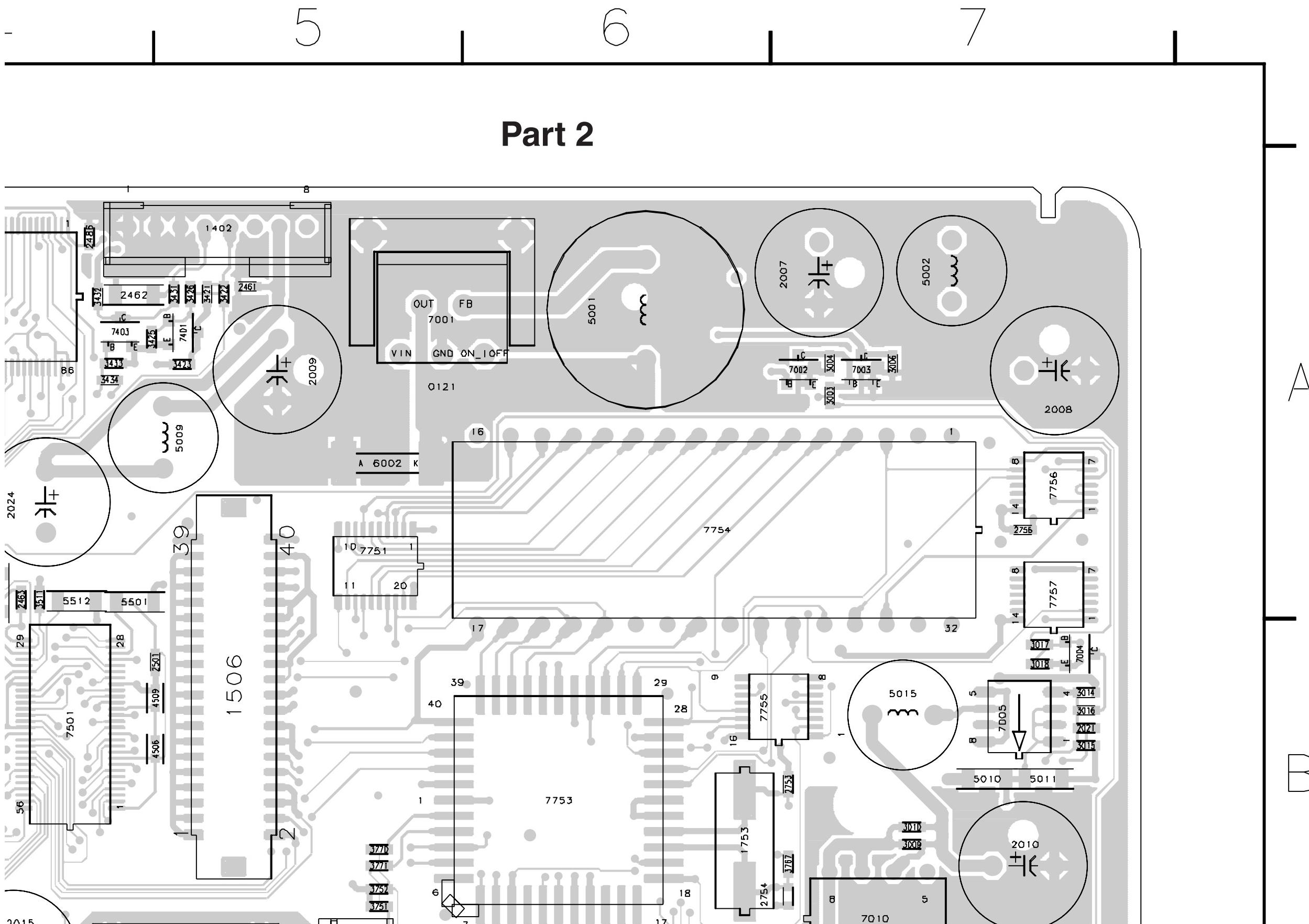
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0122	C5	1283	B1	1506	B5	2005	C2	2013	A1	2026	C7	2211	A1	2217	B2	2253	C2	2263	C1	2305	D6	2325	D6	2345	C3	2395	C3	2447	B2	2486	A4	2756	A7	3014	B7	3327	C7	5011	B7
1001	A1	1301	D6	1681	D6	2006	D3	2015	B4	2027	D7	2212	A1	2218	A1	2254	C1	2264	C1	2308	D6	2326	D7	2377	D3	2396	C3	2451	B2	2491	A3	3003	A7	3015	B7	3328	C7	5015	B7
1002	A1	1351	D3	1751	C6	2007	A7	2016	C5	2202	B1	2213	A1	2219	B2	2255	D1	2265	C1	2315	D6	2327	D7	2381	C5	2397	C3	2452	B2	2501	B5	3004	A7	3016	B7	3351	D3	5025	C7
1003	D7	1352	C2	1752	C5	2008	A7	2018	A2	2206	A1	2214	A2	2221	B1	2256	D1	2278	C2	2317	D6	2329	D7	2387	C5	2439	B2	2461	A5	2512	B4	3006	A7	3017	B7	3359	D3	5026	C7
1201	A1	1401	B2	1753	B6	2009	A5	2021	B7	2207	C2	2215	A1	2251	C2	2257	D1	2283	C2	2319	D6	2341	C3	2388	C5	2444	B2	2462	A4	2753	B7	3009	B7	3018	B7	3361	D3	5201	B1



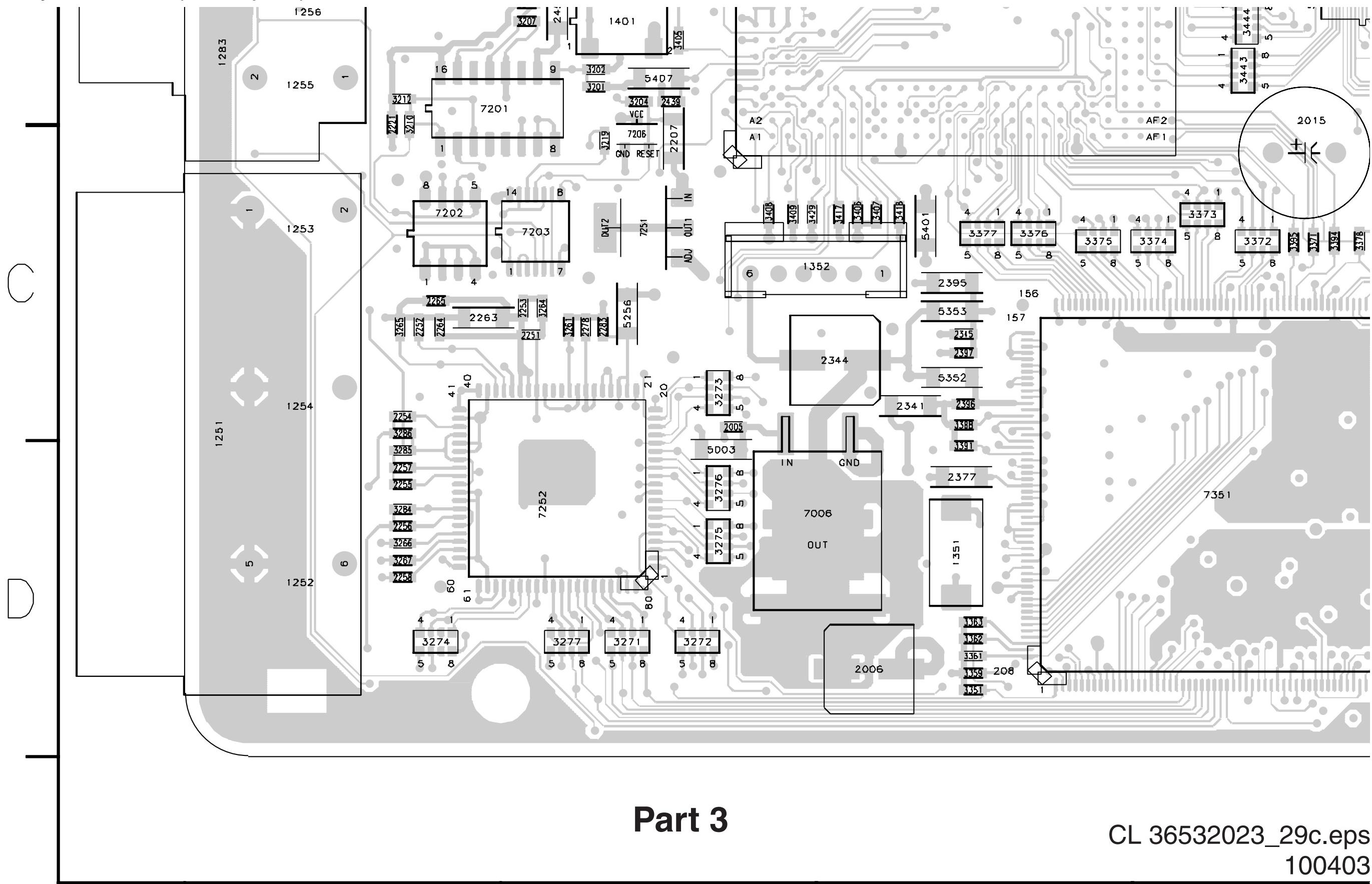
## **Layout Scaler Panel (Part 1 Top Side)**



## Layout Scaler Panel (Part 2 Top Side)



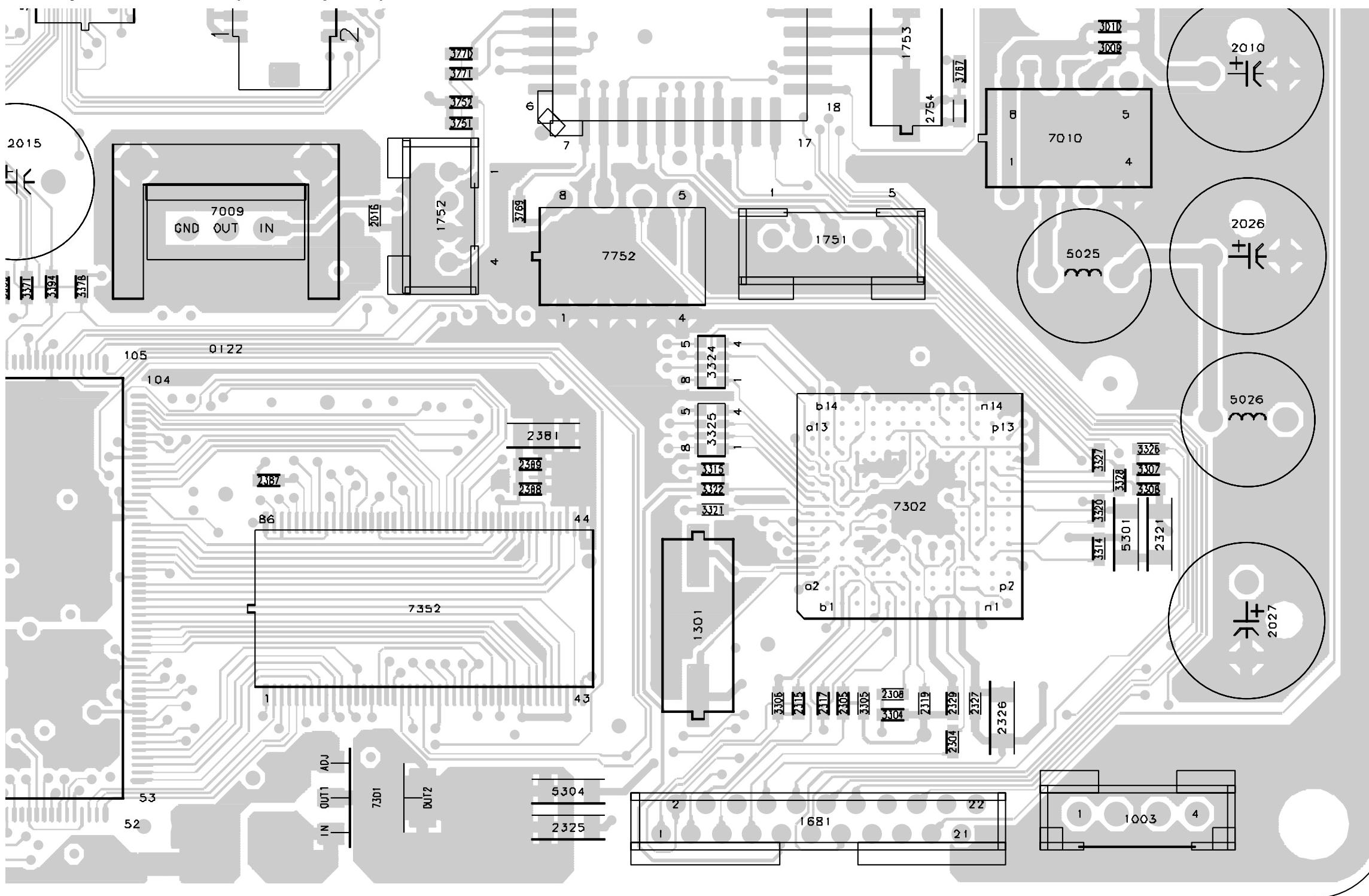
### **Layout Scaler Panel (Part 3 Top Side)**



## Part 3

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## **Layout Scaler Panel (Part 4 Top Side)**



## Part 4

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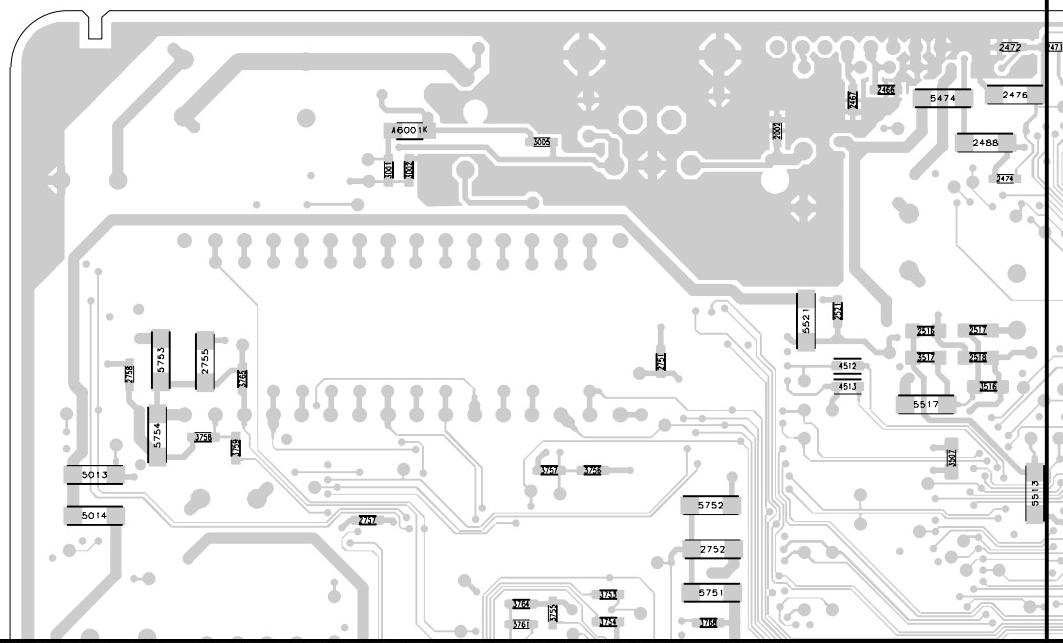
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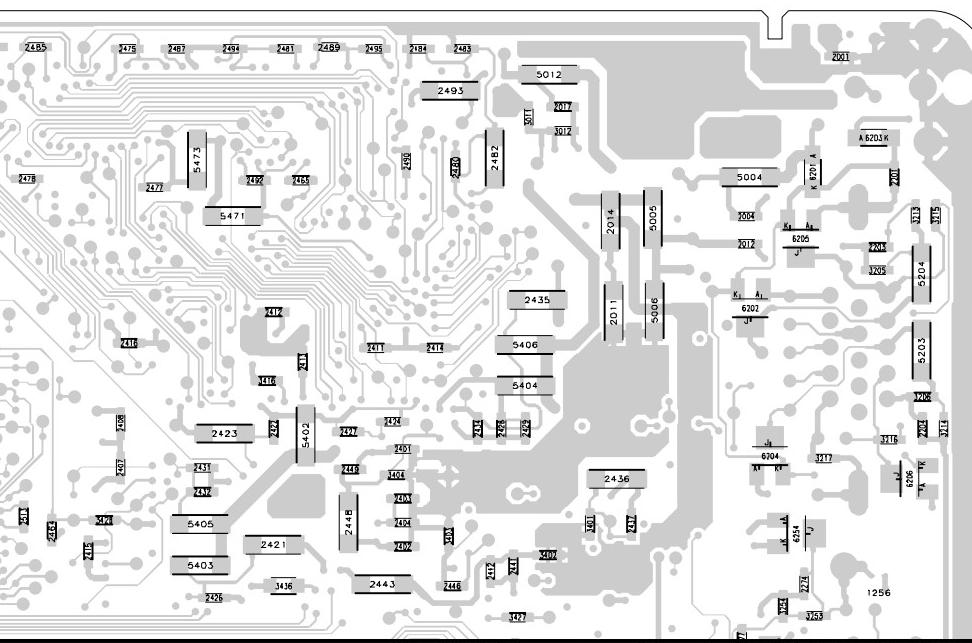
**Layout Scaler Panel (Overview Top Side)**

1252 D7 2017 A6 2262 C6 2279 C7 2316 D2 2339 D5 2357 D4 2369 C4 2384 D3 2405 C5 2421 B5 2434 B6 2465 A5 2481 A5 2494 A5 2758 A1 3208 C6 3257 D7 3352 D4 3367 C5 3404 B5 6203 A7  
 1253 C7 2019 B1 2266 D7 2281 D6 2318 D2 2342 C5 2358 D5 2371 C4 2385 D3 2407 B4 2422 B5 2435 A6 2466 A3 2482 A6 2495 A5 3001 A2 3209 C6 3258 C7 3353 D4 3368 C5 3416 A5 6204 B7  
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 2001 A7 2201 A7 2272 C7 2291 C7 2331 D2 2351 C3 2363 D4 2375 D5 2393 D3 2412 A5 2426 B5 2442 B6 2474 A4 2487 A5 2518 A4 3012 A6 3216 B7 3312 C2 3357 D4 3389 C5 3437 B5 6252 B7  
 2002 A3 2203 A7 2273 C7 2292 C7 2332 D2 2352 C4 2364 D4 2376 D5 2394 D3 2413 A5 2427 B5 2443 B5 2475 A4 2488 A4 2521 A3 3019 B1 3217 B7 3313 C1 3358 D4 3392 C4 3507 B4 6253 C7  
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 2011 A6 2205 C6 2275 D7 2294 C7 2334 D2 2354 D4 2366 D4 2379 D5 2402 B5 2415 B4 2429 B6 2448 B5 2477 A5 2490 A5 2752 B3 3203 C7 3252 C7 3323 D1 3364 D5 3401 B6 3517 A4 6255 D7  
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 2014 A6 2261 C6 2277 B7 2296 D7 2338 D5 2356 D5 2368 C5 2383 C3 2404 B5 2417 C5 2432 B5 2464 B4 2480 A6 2493 A6 2757 B2 3206 A7 3254 B7 3350 D4 3366 D5 3403 B6 3754 B2 6261 C6  
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 5432 B5  
 5433 A6  
 5434 B5  
 5435 A6  
 5436 B5  
 5437 A6  
 5438 B5  
 5439 A6  
 5440 B5  
 5441 A6  
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 5448 B5  
 5449 A6  
 5450 B5  
 5451 A6  
 5452 B5  
 5453 A6  
 5454 B5  
 5455 A6  
 5456 B5  
 5457 A6  
 5458 B5  
 5459 A6  
 5460 B5  
 5461 A6  
 5462 B5  
 5463 A6  
 5464 B5  
 5465 A6  
 5466 B5  
 5467 A6  
 5468 B5  
 5469 A6  
 5470 B5  
 5471 A5  
 5472 A4  
 5513 B4  
 5517 A4  
 5521 A3  
 5751 B3  
 5752 B3  
 5753 A1  
 5754 B1  
 6001 A2  
 6025 B1  
 6201 A7  
 6202 A7

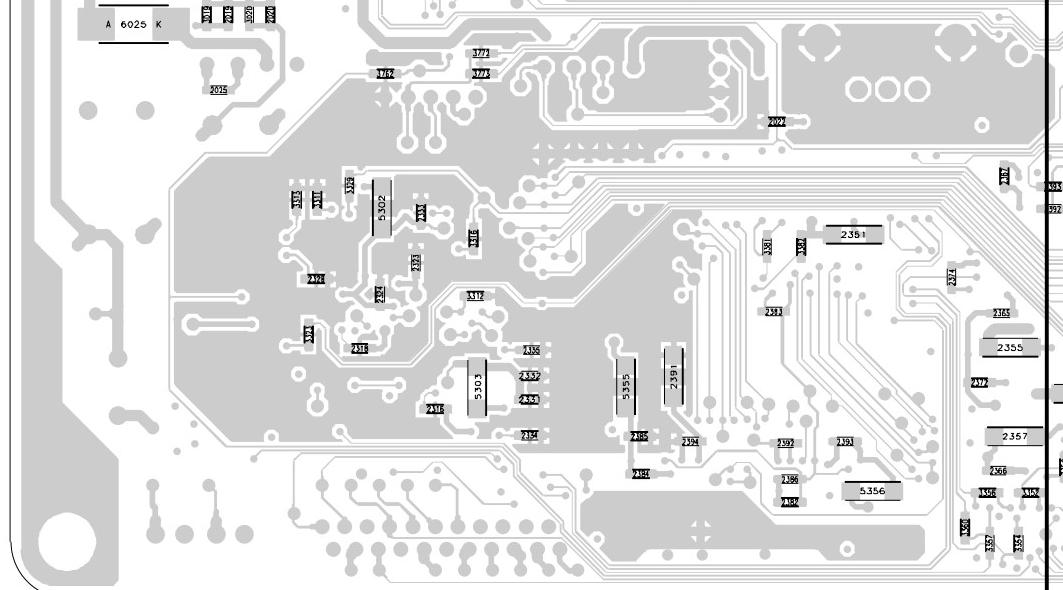
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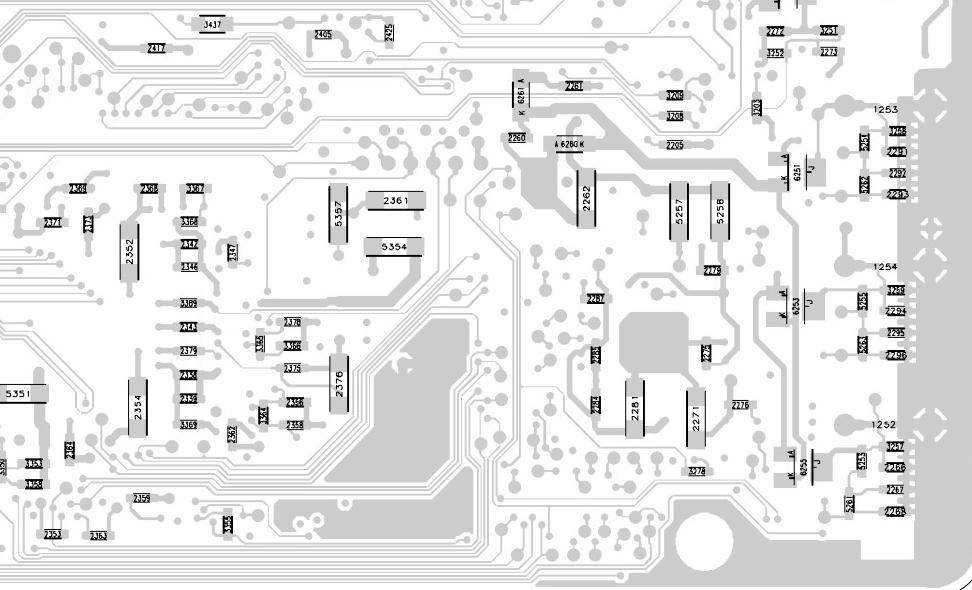
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**Part 3**  
CL 36532023\_30c.eps



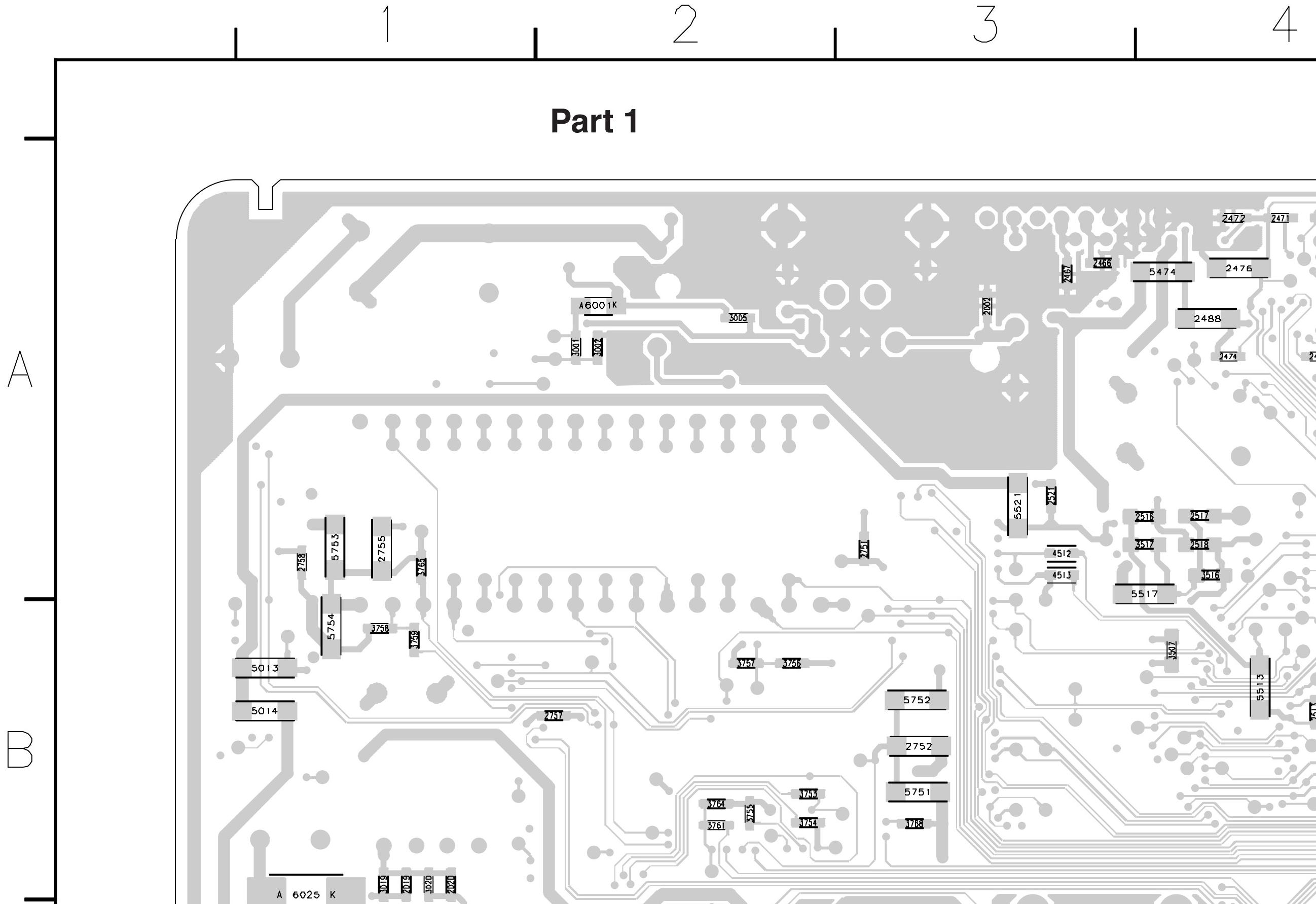
**Part 4**  
CL 36532023\_30d.eps



xxxx xxx 56802

CL 36532023\_030.eps  
090403

## **Layout Scaler Panel (Part 1 Bottom Side)**



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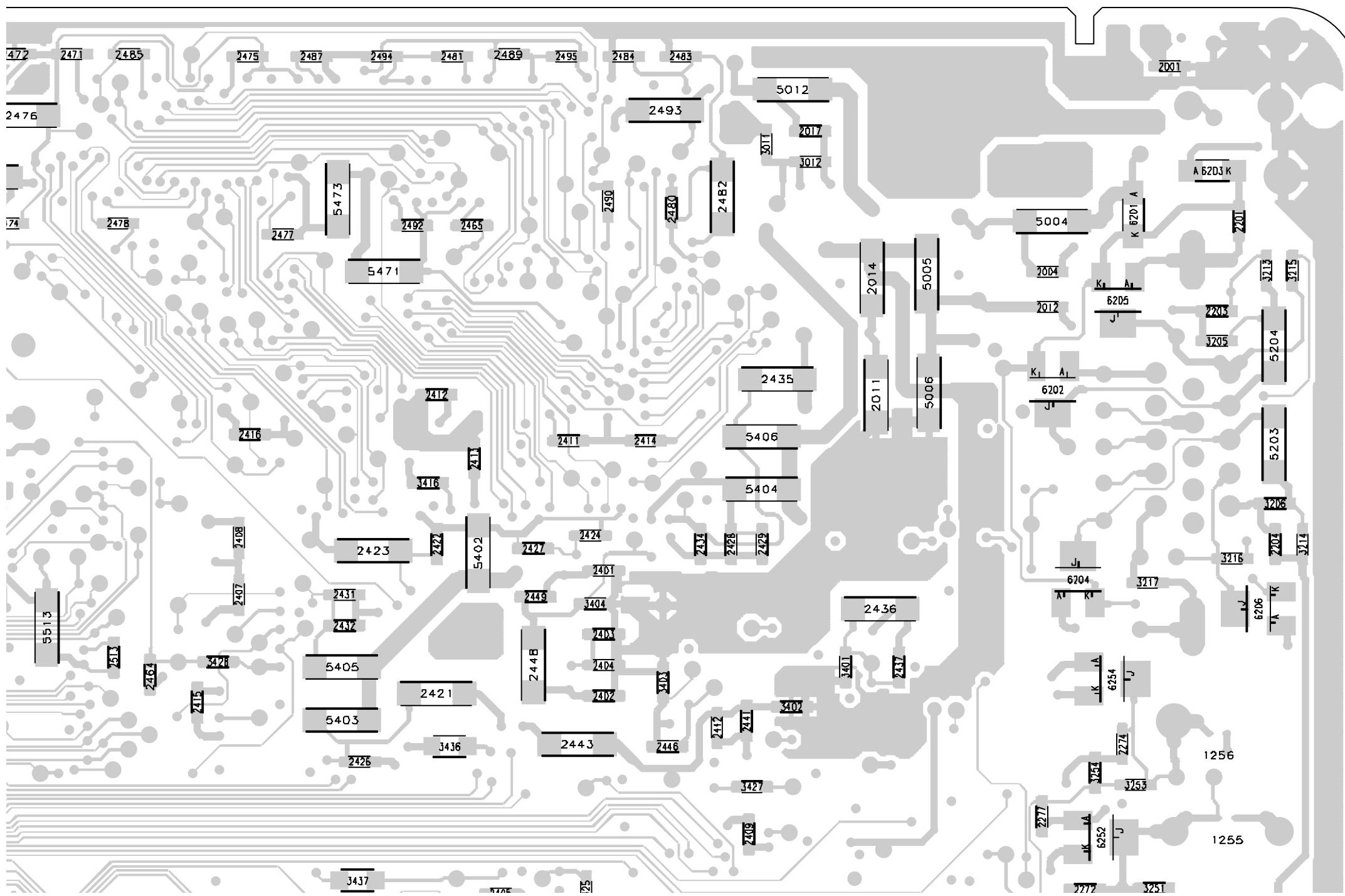
**Layout Scaler Panel (Part 2 Bottom Side)**

4

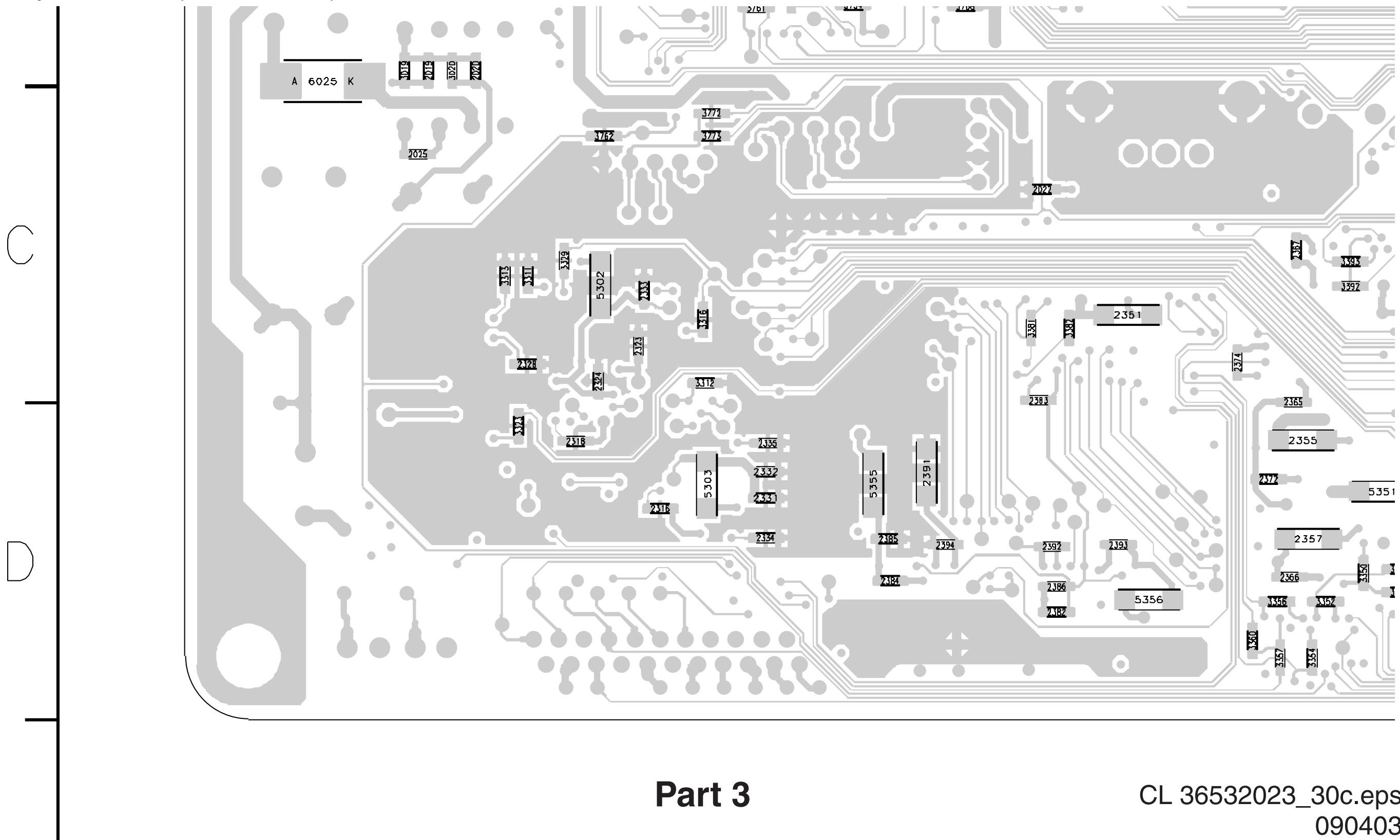
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**Part 2**

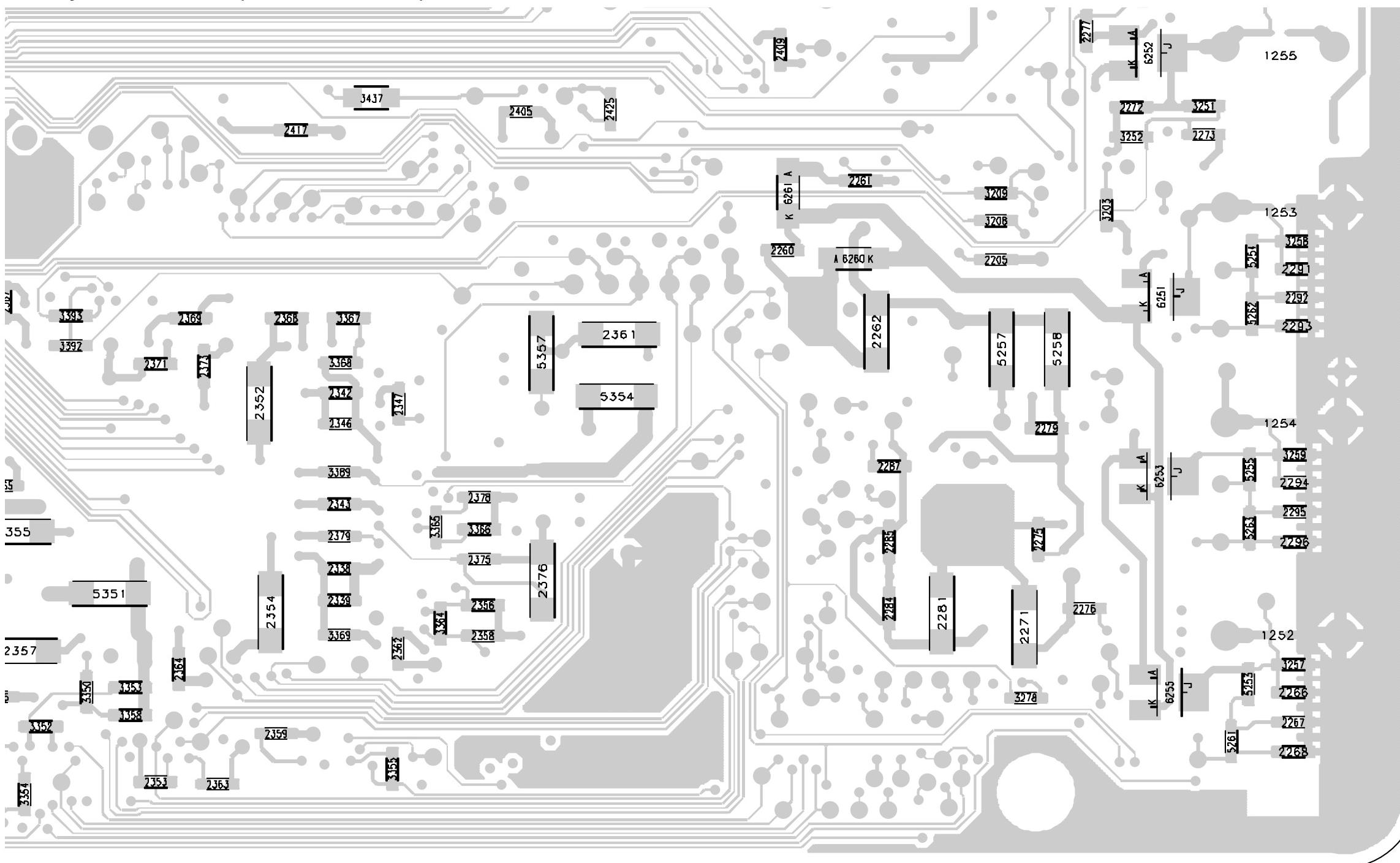
## **Layout Scaler Panel (Part 3 Bottom Side)**



## **Part 3**

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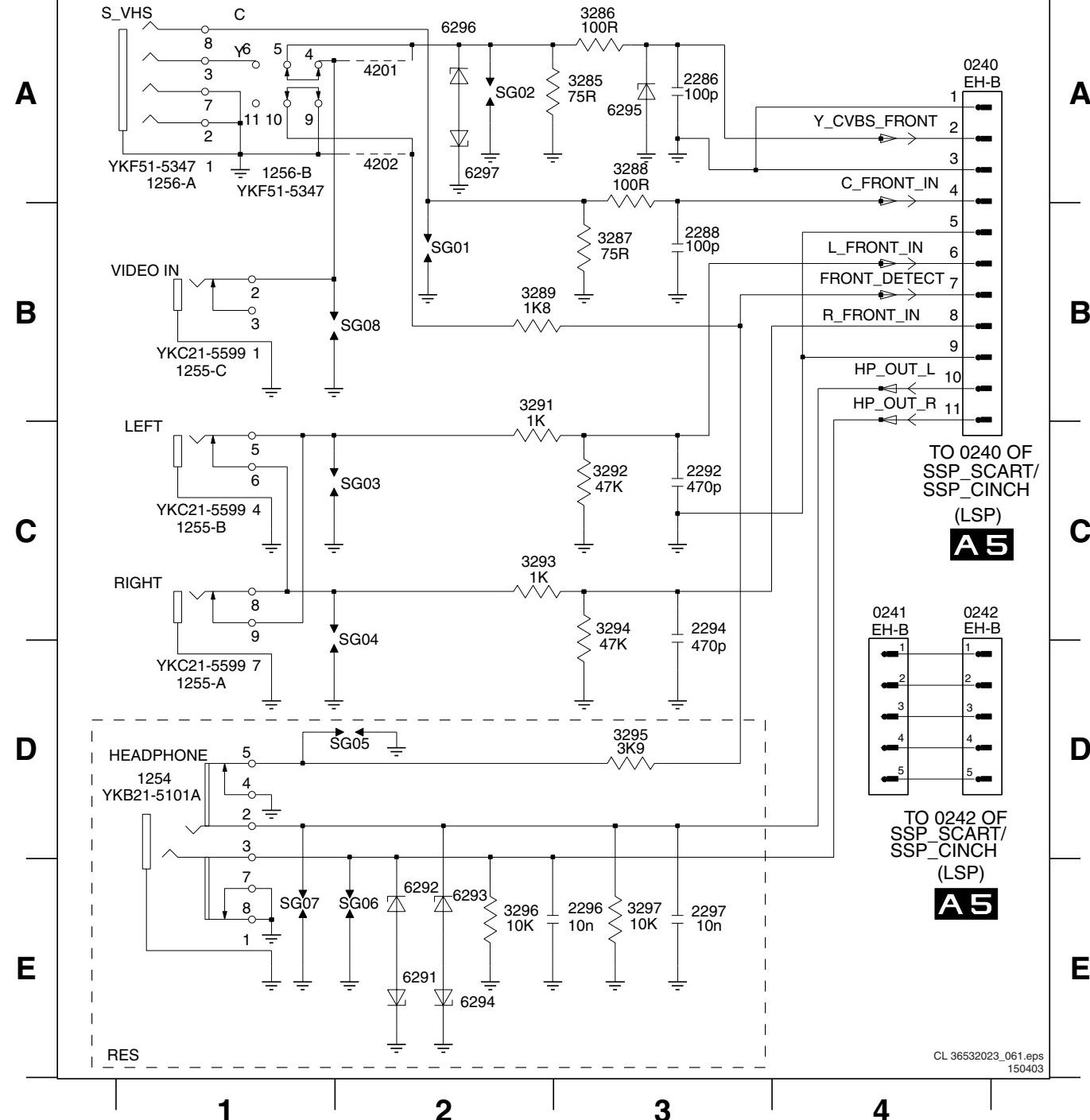
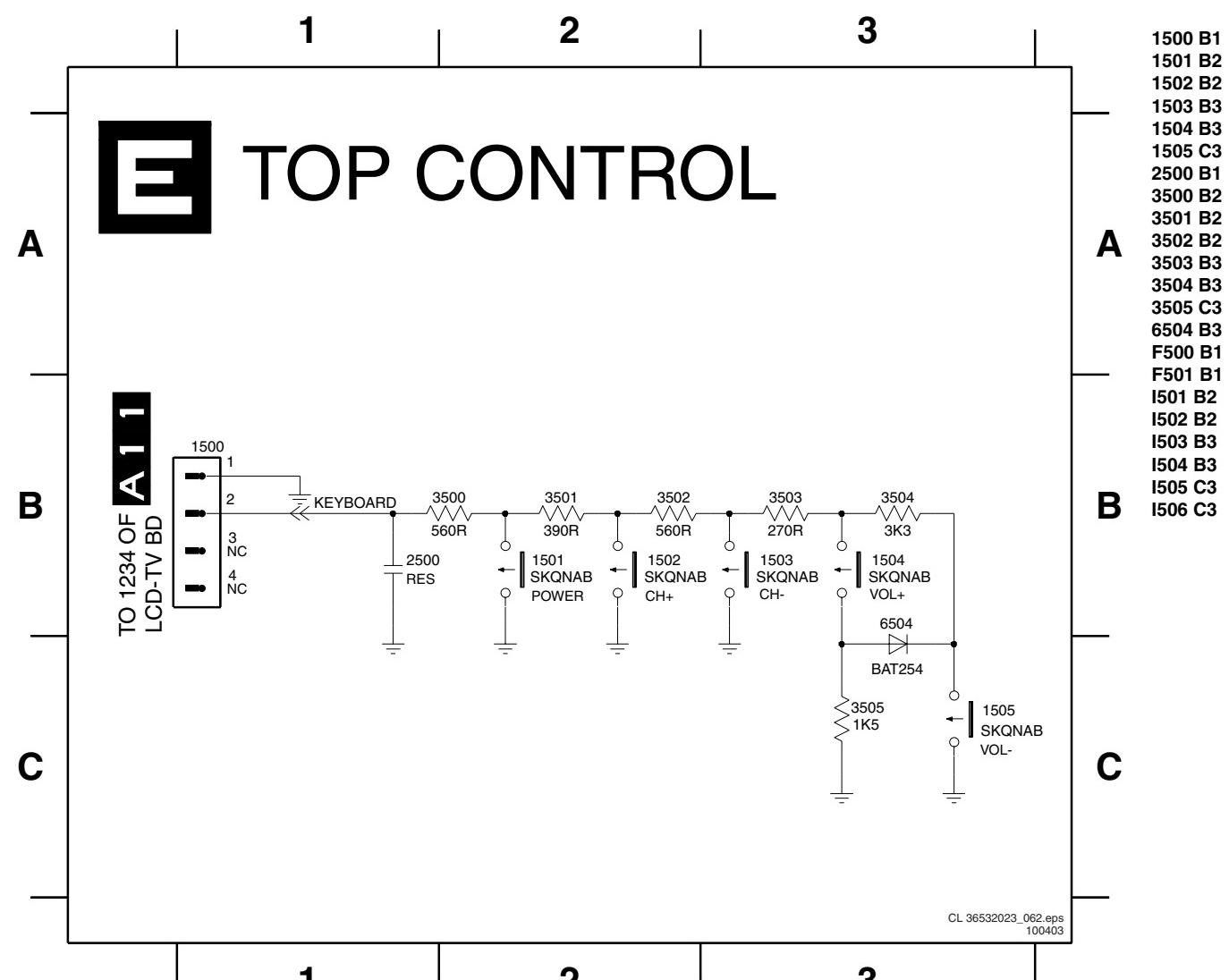
## Layout Scaler Panel (Part 4 Bottom Side)



**Side I/O Panel**

0240 A4	1256-A A1	2297 E3	3292 C3	4202 A2	6297 A2	I208 C2	I218 B2	SG03 C2
0241 C4	1256-B A1	3285 A3	3293 C2	6291 E2	I201 A2	I209 B4	I219 D3	SG04 D2
0242 C4	2286 A3	3286 A3	3294 C3	6292 E2	I202 A4	I210 B4	I220 E2	SG05 D2
1254 D1	2287 B3	3287 B3	3295 D3	6293 E2	I203 A2	I211 D2	I221 E2	SG06 E2
1255-A D1	2292 C3	3288 A3	3296 E2	6294 E2	I204 A4	I213 D2	I222 E2	SG07 E1
1255-B C1	2294 C3	3289 B2	3297 E3	6295 A3	I205 B2	I215 D2	SG01 B2	SG08 B2
1255-C B1	2296 E3	3291 B2	4201 A2	6296 A2	I206 B4	I217 A1	SG02 A2	

1      2      3      4

**SIDE IO PANEL****Top Control**

1500 B1
1501 B2
1502 B2
1503 B3
1504 B3
1505 C3
2500 B1
3500 B2
3501 B2
3502 B2
3503 B3
3504 B3
3505 C3
6504 B3
F500 B1
F501 B1
I501 B2
I502 B2
I503 B3
I504 B3
I505 C3
I506 C3

**A****B****C**

1      2      3

1

2

3

D

E

C

B

A

C

B

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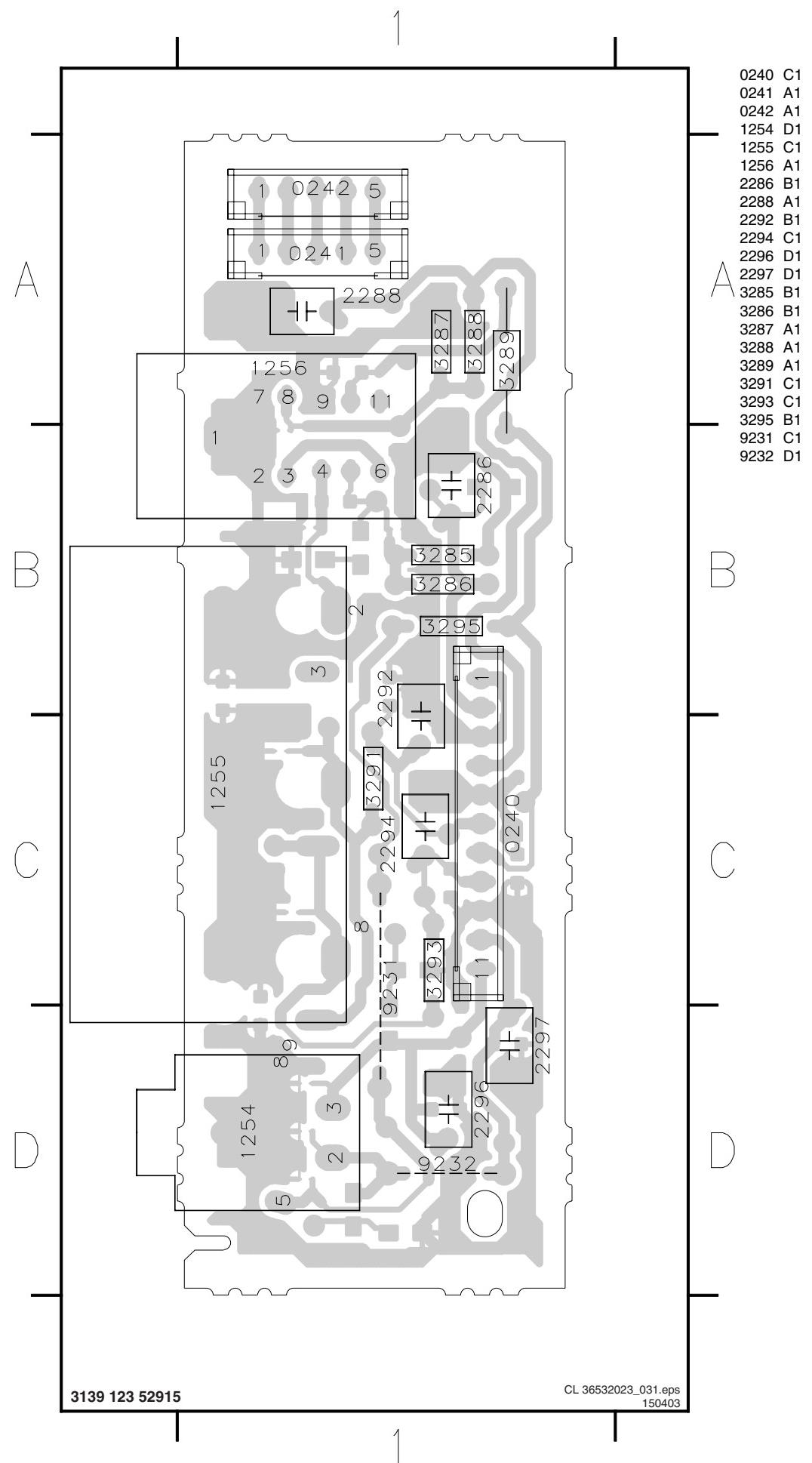
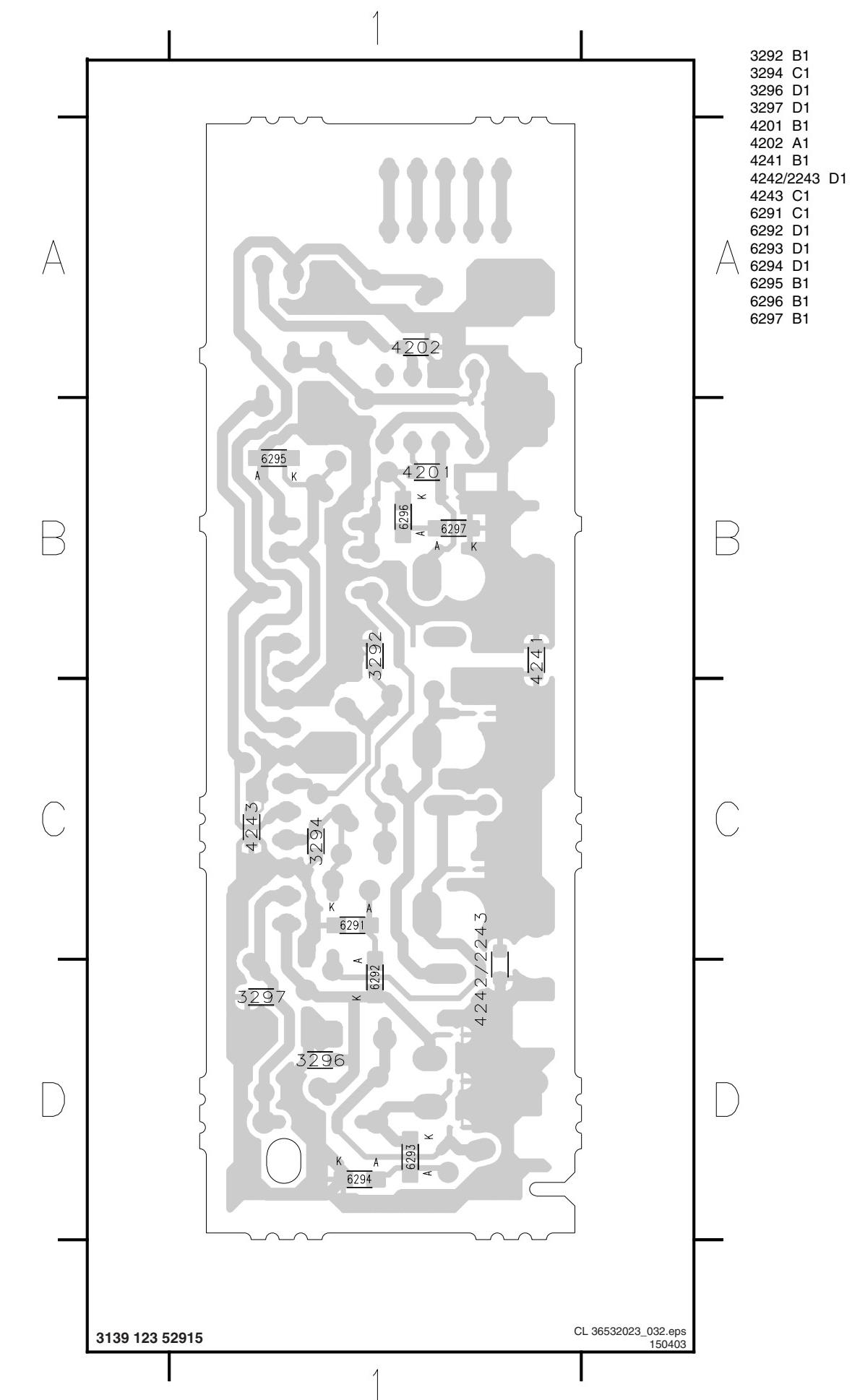
B

C

D

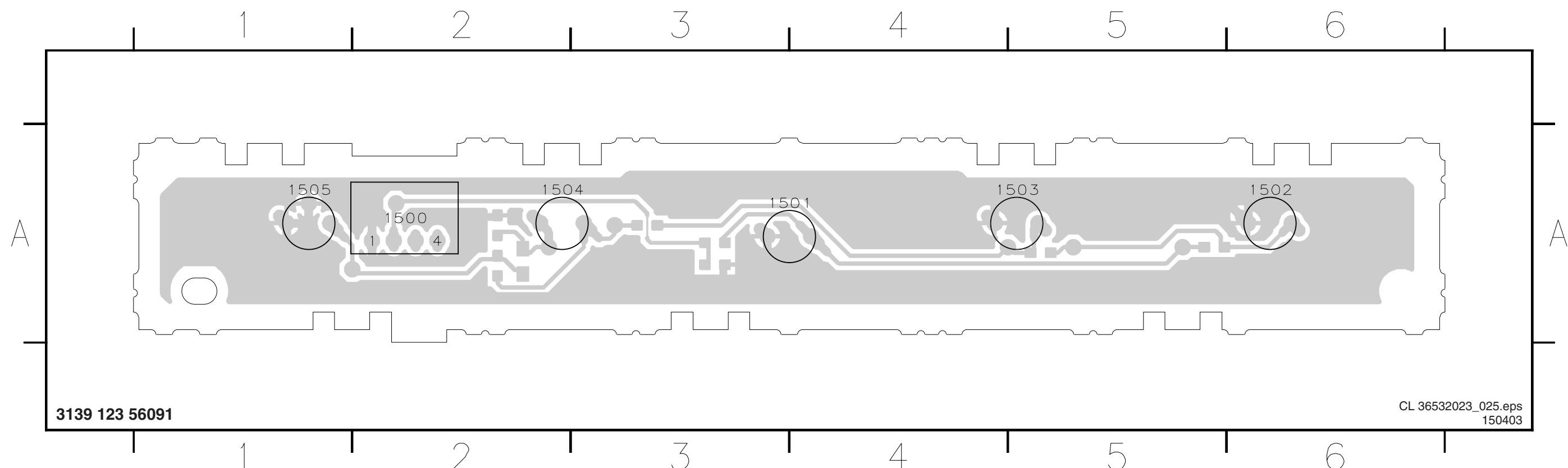
E

A

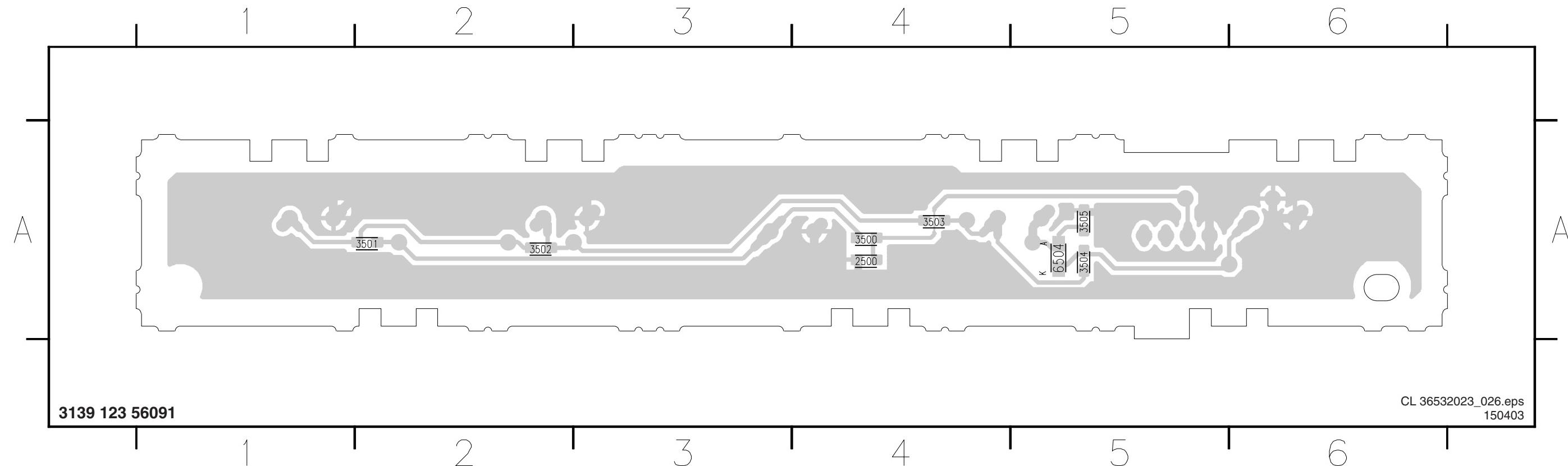
**Layout Side I/O Panel (Top Side)****Layout Side I/O Panel (Bottom Side)**

**Layout Top Control (Top Side)**

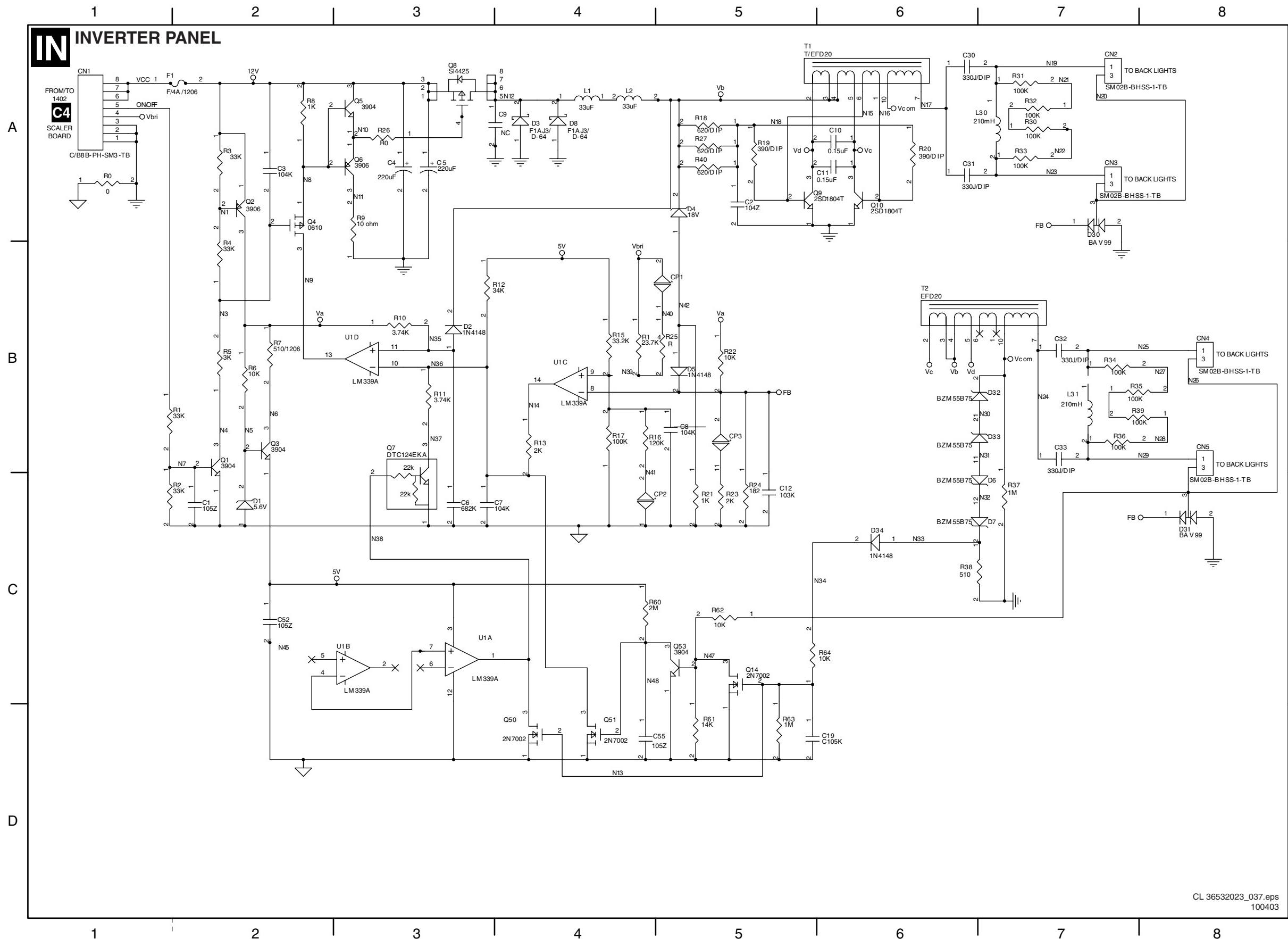
1500 A2 1501 A3 1502 A6 1503 A5 1504 A2 1505 A1

**Layout Top Control (Bottom Side)**

2500 A4 3500 A4 3501 A2 3502 A2 3503 A4 3504 A5 3505 A5 6504 A5



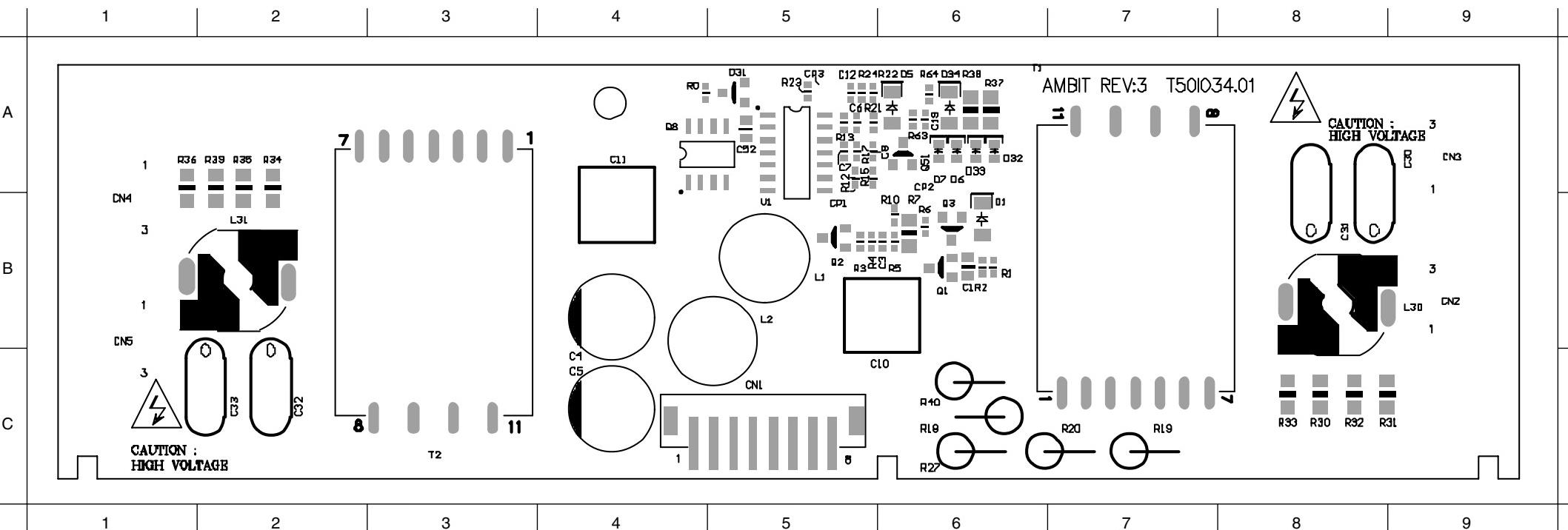
# Inverter Panel

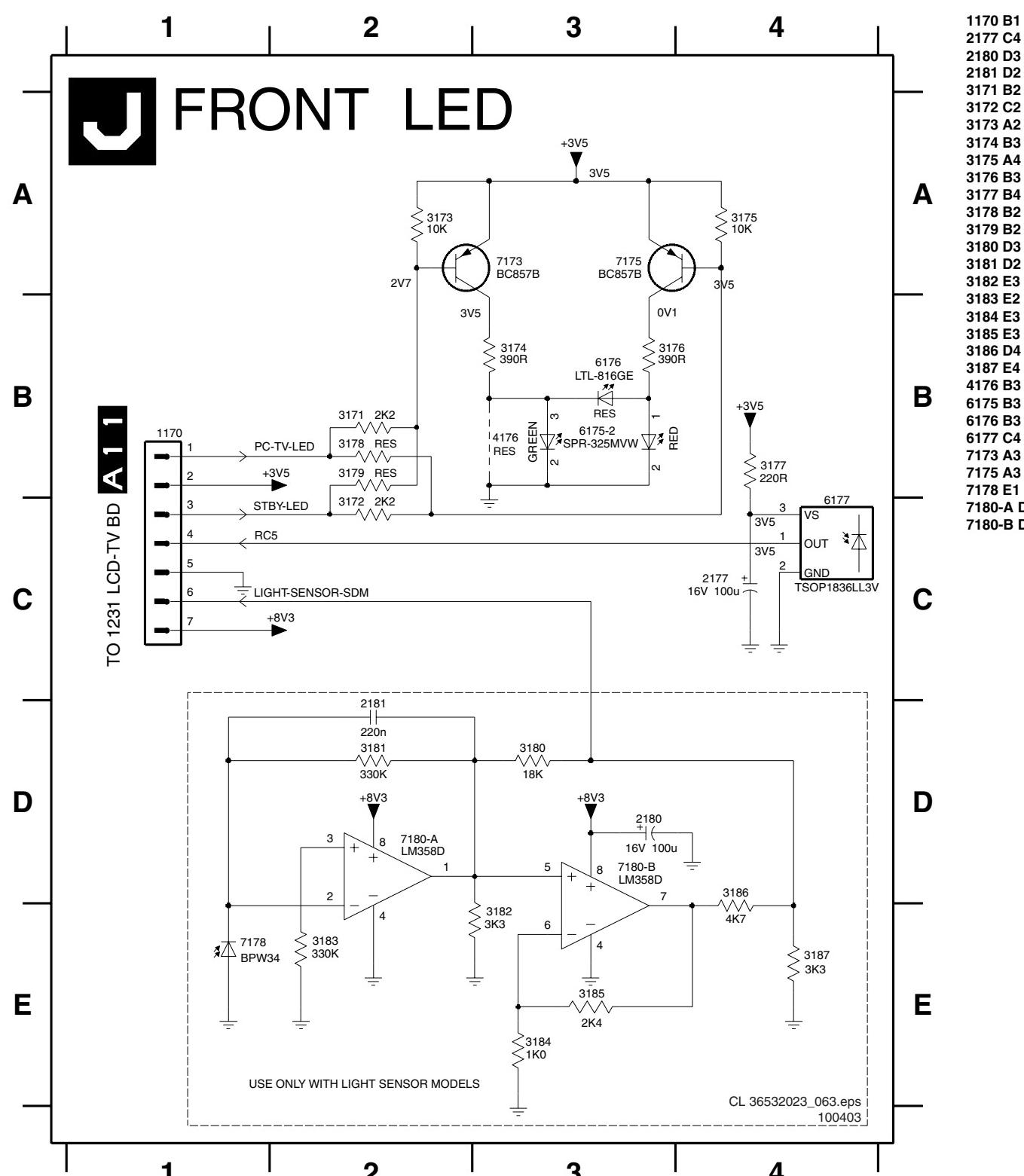
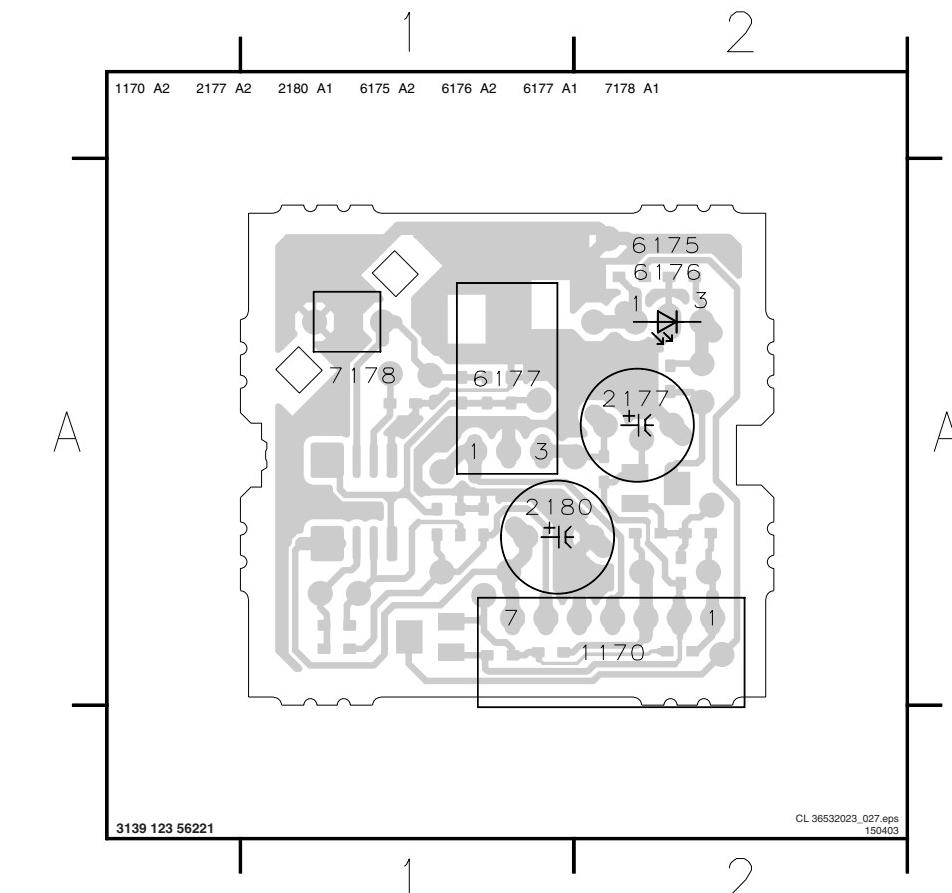
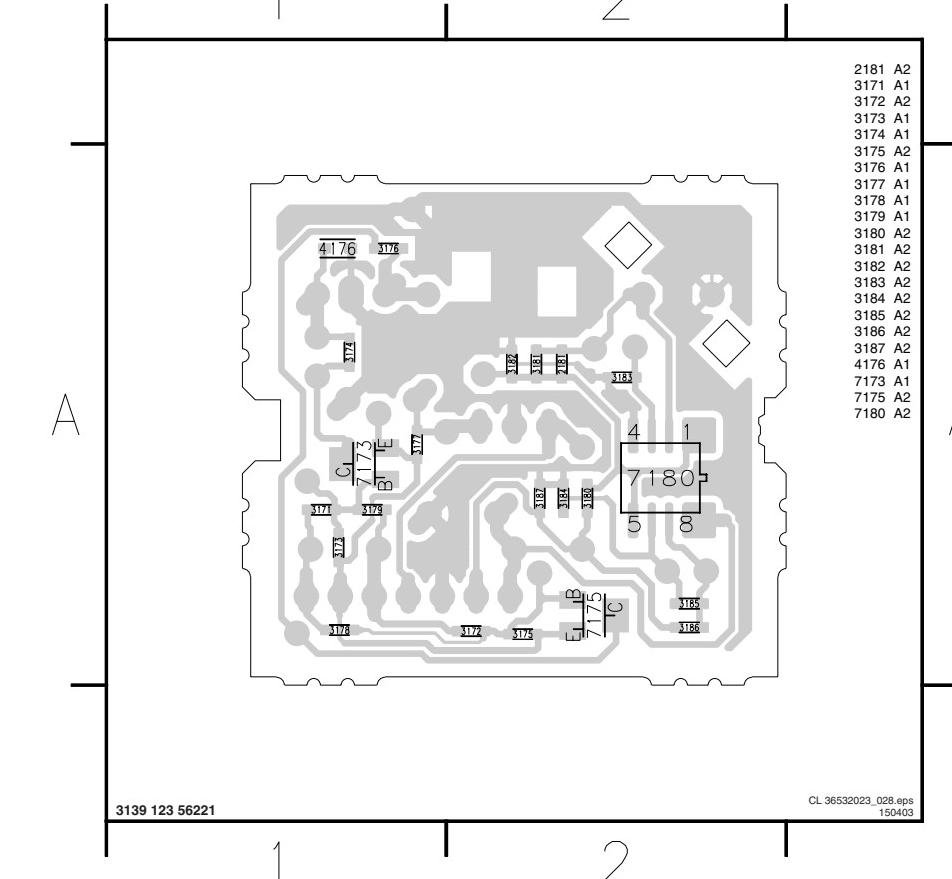


C1	C2	R0	A1
C2	A5	R1	B2
C3	A2	R2	C2
C4	A3	R3	A2
C5	A3	R4	B2
C6	C3	R5	B2
C7	C3	R6	B2
C8	B5	R7	B2
C9	A4	R8	A2
C10	A6	R9	A3
C11	A6	R10	B3
C12	C5	R11	B3
C19	D6	R12	B3
C30	A6	R13	B4
C31	A6	R14	B4
C32	B7	R15	B4
C33	B7	R16	B4
C52	C2	R17	B4
C55	D4	R18	A5
CN1	A1	R19	A5
CN2	A7	R20	A6
CN3	A7	R21	C5
CN4	B8	R22	B5
CN5	B8	R23	C5
CP1	B5	R24	C5
CP2	C4	R25	B5
CP3	B5	R26	A3
D1	C2	R27	A5
D2	B3	R30	A7
D3	A4	R31	A7
D4	A5	R32	A7
D5	B5	R33	A7
D6	C7	R34	B7
D7	C7	R35	B7
D8	A4	R36	B7
D30	A7	R37	C7
D31	C8	R38	C6
D32	B7	R39	B7
D33	B7	R40	A5
D34	C6	R60	C4
F1	A1	R61	D5
L01	A4	R62	C5
L02	A4	R63	D5
L30	A7	R64	C6
L31	B7	T1	A5
Q1	B2	T2	B6
Q2	A2	U1A	C3
Q3	B2	U1B	C3
Q4	A2	U1C	B4
Q5	A3	U1D	B3
Q6	A3		
Q7	B3		
Q8	A3		
Q9	A5		
Q10	A6		
Q14	C5		
Q50	D4		
Q51	D4		
Q53	C5		

**Layout Inverter Panel**

C1	B6	C19	A6	CN5	B1	D33	A6	R0	A4	R13	A5	R27	C6	R39	A2
C3	B6	C30	A8	CP1	B5	D34	A6	R1	B6	R15	A5	R30	C8	R40	C6
C4	C4	C31	B8	CP2	A6	L2	B5	R2	B6	R17	A5	R31	C8	R63	A6
C5	C4	C32	C2	CP3	A5	L30	B8	R3	B5	R18	C6	R32	C8	R64	A6
C6	A5	C33	C2	D1	B6	L31	B2	R4	B5	R19	C7	R33	C8	T1	B7
C7	A5	C52	A5	D5	A6	Q1	B6	R5	B6	R20	C7	R34	A2	T2	B3
C8	A5	CN1	C5	D6	A6	Q2	B5	R6	B6	R21	A5	R35	A2	T3	B7
C10	C5	CN2	B9	D7	A6	Q3	B6	R7	B6	R22	A6	R36	A1	U1	A5
C11	A4	CN3	A9	D31	A5	Q8	A4	R10	B6	R23	A5	R37	A6		
C12	A5	CN4	B1	D32	A6	Q51	A6	R12	A5	R24	A5	R38	A6		



**Front LED Panel****Layout Front LED Panel (Top Side)****Layout Front LED Panel (Bottom Side)**

## 8. Alignments

General: The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5. Menu navigation is done with the CURSOR UP, DOWN, LEFT or RIGHT keys of the remote control transmitter.

### 8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:  
 Mains voltage and frequency: 100-240 V / 50/60 Hz.  
 Allow the set to warm up for approximately 10 minutes.  
 Test probe:  $R_i > 10 \text{ MOhm}$ ;  $C_i < 2.5 \text{ pF}$ .

#### 8.3.1 SAM Menu

##### SAM Menu

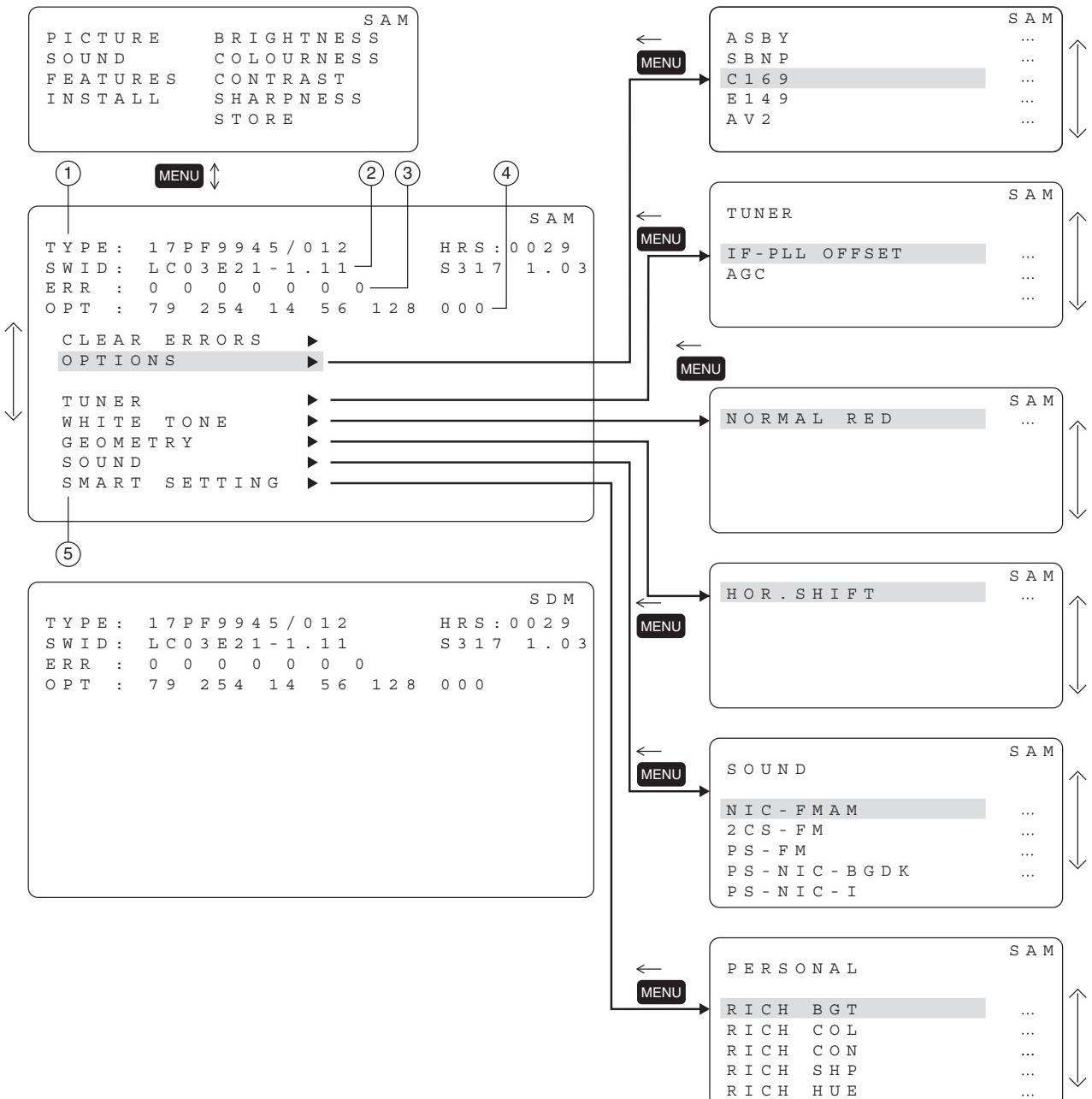


Figure 8-1 SAM Menu

### 8.3.2 Geometry

The geometry alignments menu contains 2 items to align a correct picture geometry. In wide screen sets, the GEOMETRY SW is available for separate alignments of the super wide (panorama) mode. The geometry alignments are:

- HOR SHIFT; align the horizontal centre of the picture to the horizontal centre of the display.
- H60 SHIFT; display alignment when using the system on a 60Hz network.

### 8.3.3 White Tone

In the WHITE TONE sub menu the colour values for the colour temperature values can be changed.

The colour temperature mode (NORMAL, DELTA COOL, DELTA WARM) or the colour (R, G, B) can be selected with the RIGHT/LEFT cursor keys. The mode or value can be changed with the UP/DOWN cursor keys.

First the values for the NORMAL colour temperature should be selected. Range: 0-255, 128 represent the middle of the value (no offset difference). Then the offset values for the DELTA COOL and DELTA WARM mode can be selected. Note that the alignment values are non-linear. The range is: -50 to +50, 0 represent the middle value, (no offset difference).

Input signal strength:>=10 mVrms (80 dBV) terminal voltage.

Input injection point:Aerial input.

#### **Align Method**

##### Initial Set-up

- 20 minutes soaking time before carrying out Colour Temp alignment.
- Incredible Picture/Contrast+ and Active Control (Blue stretch off) must be switched OFF for proper tracking.
- Set all colour temperature settings to their initial values, i.e. RED=128; Green=128; BLUE=128.
- The offset values for COOL & WARM should be preloaded into NVM.
- The alignment is done for NORMAL only.

#### **Method of Alignments**

Place the colour sensor of the meter at the center of the screen. Set the meter in (T, ,Y) mode.

Set brightness and colour to nominal (factory mode).

Set colour temp to normal.

Set contrast to make the light output Y on the meter 250 nit +/- 10%.

Set RED=131.

Adjust GREEN to bring to the value as in the table.

Repeat the procedure if necessary to obtain the values as in the table.

#### **Expected Results**

Measured parameters: Refer to table.

Specifications: Refer to table.

Units of measurement: Kelvin.

**Table 8-1 Colour temperatures**

Colour temp.	NORMAL		COOL		WARM	
	T (K)	$\Delta$ UV	T (K)	$\Delta$ UV	T (K)	$\Delta$ UV
EUROPE	8,500	-005	11,500	-005	7,000	-005
AP	8,500	-005	11,500	-005	7,000	-005
USA	8,500	-005	11,500	-005	7,000	-005
LATAM	8,500	-005	11,500	-005	7,000	-005
Tolerance	+/- 10%	+/-003	+/-10%	+/-003	+/-10%	+/-003

### 8.3.4 Tuner Adjustment

#### AGC (RF AGC Take Over Point)

Set pattern generator (e.g. PM5418) with colour bar pattern and connect to aerial input with RF signal amplitude - 10mV and set frequency for PAL/SECAM to 475.25 MHz. For France select the L'-signal.

- Activate the SAM-menu. Go to the sub-menu TUNER, select the sub-menu option AFC WINDOW and adjust the value to 100kHz.
- Select the AGC sub-menu
- Connect a DC multi-meter to pin 1 of the tuner IC 1225.
- Adjust the AGC until the voltage at pin 1 of the tuner is 1.0V +/- 0.1V.
- The value can be incremented or decremented by pressing the right/left MENU-button on the RC.
- Switch the set to standby to store the data.

#### **Tuner options - IF PLL OFFSET and AFC WINDOW**

NO ADJUSTMENTS NEEDED FOR THESE ALIGNMENTS

The default values for these options are:

- IF PLL OFFSET: 31 (default)
- AGC WINDOW: 24 (default)

### 8.3.5 Sound

NO ADJUSTMENTS NEEDED FOR SOUND

The default values for the audio alignments are:

- NIC-FMAM :250 NICAM error rate threshold, the higher the more tolerance
- 2CS-FM :40
- PS-FM :38 Prescale for FM
- PS-NIC BG/DK:82 Prescale for NICAM in BG/DK system
- PS-NIC I :127 Prescale for NICAM in I system
- PS-NIC L :82 Prescale for NICAM in L system

## 8.4 Options

### 8.4.1 Options

Options are used to control the presence / absence of certain features and hardware. There are two ways to change the option settings, see figure 1: "Service Alignments Mode screens and structure".

#### **Changing a Single Option**

An option can be selected with the MENU UP/DOWN keys and its setting can be changed with the MENU LEFT/RIGHT keys

#### **Changing multiple options by changing option byte values**

Option bytes make it possible to set very fast all options. An option byte represents a number of different options. All options of the chassis are controlled via 5 option bytes. Select the option byte (OB1, OB2, OB3, OB4, OB5) and key in the new value.

### 8.4.2 List of options

Unless otherwise stated Y(es) means present (or ON), N(o) means not present (or OFF).

Table 8-2 List of options

Features	AbbreviationsLC03	Description
Auto Standby (after 2 hours)	ASBY	OFF=Disabled auto standby. ON=Enabled auto standby after 2 hours.
Auto Standby No Picture	SBNP	OFF=Disabled, no automatic switch to standby. ON=Enabled, switches to standby after 10 minutes when no ident.
Picture setting for Compress 16:9	C169	OFF=Disabled, 16:9 COMPRESS setting is not available in FORMAT menu. ON=Enabled 16:9 COMPRESS setting is available in FORMAT menu item.
Picture setting for Expand 14:9	E149	OFF=Disabled, 14:9 EXPAND setting is not available in FORMAT menu. ON=Enabled 14:9 EXPAND setting is available in FORMAT menu item.
SCART2 AV Source	AV2	OFF=Disabled, AV2 not available. ON=Enabled, AV2 available.
Side AV Source	AV3	OFF=Disabled, side AV not available. ON=Enabled side AV available.
Auto Standby with timer	AUSB	OFF=Disabled. ON=Enabled.
Wide Screen	WSCR	OFF=Disabled, wide screen is displayed by FORMAT. ON=Enabled, FORMAT is replaced by WIDESCREEN.
Comb Filter	CBFL	OFF=Disabled, no comb filter on the SSB. ON=Enabled, comb filter on the SSB.
Incredible Picture	IPIX	OFF=Disabled, INCR, PICT is replaced by CONTRAST+ ON=Enabled, CONTRAST+ is replaced by INCR, PICT.
Incredible Picture via Menu	IPMU	OFF=Disabled, menu item INCR. PICT not available. ON=Enabled, menu item INCR. PICT available.
Virtual Dolby	VDBY	OFF=Disabled, menu item DOLBY VIRTUAL not available. ON=Enabled, menu item DOLBY VIRTUAL available.
Philips Tuner	PITN	OFF=Disabled, ALPS compatible tuner is used. ON=Enabled, Philips compatible tuner is used.
Automatic Channel Installation	ACI	OFF=Disabled, Automatic Channel Installation. ON=Enabled Automatic Channel Installation.
Automatic Tuning System	ATS	OFF=Disabled, automatic tuning system is ignored. ON=Enabled Automatic tuning system, sort the program in an ascending order starting from Program 1.
Program List	PLST	OFF=Disabled, the access to program List Command is ignored. ON=Enabled the access to program List Command is processed.
Virgin Mode	VMOD	OFF= Virgin mode disabled. ON= Virgin mode enabled.
Smart OSD (Picture and sound)	SOSD	OFF=Disabled, full display of OSD not available. ON=Enabled, full display of OSD available.
Favorite Page	FAPG	OFF=Disabled favorite page in Teletext mode. ON=Enabled favorite page in Teletext mode.
UK Plug and Play	UKPNP	OFF=Disabled, cannot access 'Plug and Play'. ON=Enabled, can access 'Plug and Play'.
Dual page Teletext	DTXT	OFF=Disable Dual page Teletext. ON=to enable Dual page Teletext.
Video Mute	VMUT	OFF=Disabled, no video blanking during channel/source change. ON=Enabled, video blanking during channel/source change.
Automatic Volume Leveller	AAVL	OFF=Disable, menu item AVL not available. ON=to enable, menu item AVL available.
Sound Board MSP3451	SNIC	OFF=Disabled, Sound IC MSP3451 is not present. ON=Enabled, Sound IC MSP3451 is present.
Time Window	TMWIN	OFF=Disabled, Time Window is set to 2 secs. ON=Enabled, Time Window is set to 5 secs.
Max No. of Programs	NPRG	OFF=Disabled, maximum no. of program 100. ON=Enabled maximum no. of program 80.
Wide Screen Signal Bit	WSSB	OFF=disable the detection of off-air transmission wide screen signal bit. ON=to enable the detection.
Internal Comb Filter	INCF	OFF=disable the BOCMA internal comb filter (for demo purpose). ON=to enable.
NVM data protection	NVM	OFF=Disabled. ON=Enabled.

Features	AbbreviationsLC03	Description
HML	HML	OFF
		ON
Active control DEMO	ADEMO	OFF=Disable active control demo.
		ON=Enabled active control demo.
Light Sensor	LSEN	OFF=Disable light sensor.
		ON=Enable light sensor.
FM radio ON	FMON	OFF=Disable FM radio.
		ON=Enable FM radio.
System	SYSTEM	EW - Select West. Europe's colour and sound system.
		EE - Select East. Europe's colour and sound system.
		EM - Select Central Europe's colour and sound system.
Option Byte 1	OB1	8 bits, (used)
Option Byte 2	OB2	8 bits, (used)
Option Byte 3	OB3	8 bits, (used)
Option Byte 4	OB4	8 bits, (used)
Option Byte 5	OB5	8 bits, (used)
Option Byte 6	OB6	8 bits, (not used)
Option Byte 7	OB7	8 bits, (not used)
Option Byte 8	OB8	8 bits, (not used)

#### 8.4.3 Option bits/bytes (Default values)

Table 8-3 Option bytes default values

	15PF9936/12	17PF9945/12	23PF9945/12	15PF9936/58	17PF9945/58	23PF9945/58
OB1	118	79	79	123	79	79
OB2	175	191	191	87	223	223
OB3	39	47	47	163	167	167
OB4	24	56	57	140	156	156
OB5	128	128	128	64	64	192
OB6	0	0	0	0	0	0
OB7	0	0	0	0	0	0
OB8	0	0	0	0	0	0

Note: Set all "Not used" Option bytes to 0

## 9. Circuit Descriptions and Abbreviation List

Index of this chapter

1. Introduction
2. Block Diagram
3. Power Supply
4. Input/Output
5. Tuner and IF
6. Video: TV board
7. Video: Scaler Board
8. Audio Processing
9. Control
10. Inverter

11. LCD Display
12. Abbreviation List
13. IC Data Sheets

### 9.1 Introduction

The LC03 LCD TV is based on the A10 Small Signal Board, with additional I/O's, Tuner, Scaler Board, and Audio Amplifier. The Scaler board is added, for scaling all input signals to the preferred LCD resolution.

### 9.2 Block Diagram

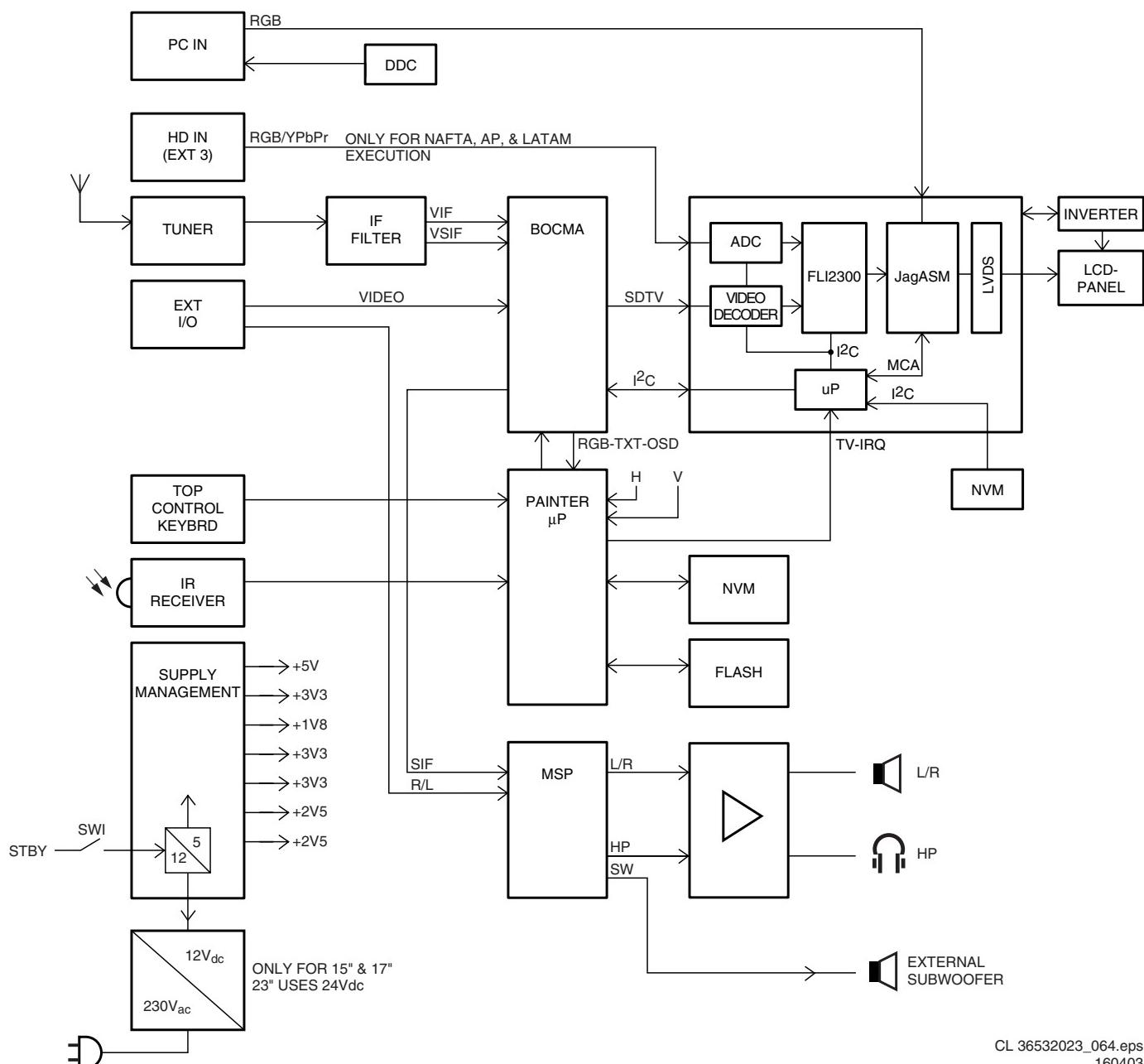


Figure 9-1 Block diagram LCD TV

The PLL tuner UR1316 (with FM radio) delivers the IF-signal, via audio & video SAW-filters, to the multi-system TV processor TDA888x (item 7301, also called BOCMA). This IC has the following functions:

- Multi-system decoder.
- Video source- and record select.
- Colour decoder.
- RGB output.
- Sound demodulator.
- Geometry control.
- Picture improvement.
- Synchronisation.

The BOCMA has one input for the internal CVBS signal and two inputs for external CVBS or Y signals. It has only one chroma input so that it is not possible to apply two separate Y/C inputs. The selection is made via the I2C-bus.

It has two independently switchable CVBS outputs for e.g. TXT, Comb-filter, CVBS-monitor, or PIP (optional).

Two SCART-connectors are used: SCART1 is fully equipped and SCART2 is meant for VCR. Pin 10 of SCART2 is used for Easylink (P50) and there is a possibility for Y/C in. The CVBS-out on pin 19 can be used for WYSIWYR (What You See Is What You Record).

Internal video processing is done with YUV-signals. It also handles the video control, geometry part, and the insertion of the TXT/OSD RGB-signals. The video part delivers the RGB signals to the Scaler panel.

The Scaler board can receive three video input signals: SDTV (from BOCMA), HD (from external HD source like DVD), or PC (from external computer).

The SDTV and HD signal are first digitalised, after which they enter the Fli2300. This component does de-interlacing, scaling, and video processing. The PC signals are processed in the JagASM scaler chip. This chip does noise reduction, de-interlacing, motion adaptation, and Frame Rate Conversion on the PC signals.

After the video processing, the digital data is send via a Low Voltage Differential Signalling bus to the LCD panel. LVDS is used to improve data speed and to reduce EMI significantly.

There are two I2C lines and one parallel addressing line (MCA) for the Scaler control. SCL-1 and SDA-1 are the communication lines between the TV-board (=Painter) and the Scaler board. Herewith is the Scaler microprocessor the master. The TV-IRQ signal is normally "high". Whenever the Painter needs to communicate with the Scaler microprocessor, it will pull the TV-IRQ line "low".

The JagASM is not an I2C device. The Scaler microprocessor controls directly this chip via a dedicated parallel bus (MCA).

The microprocessor, called Painter (SAA55XX, IC7064), takes care of the set control, error generation and analogue TXT/ OSD input- and output processing.

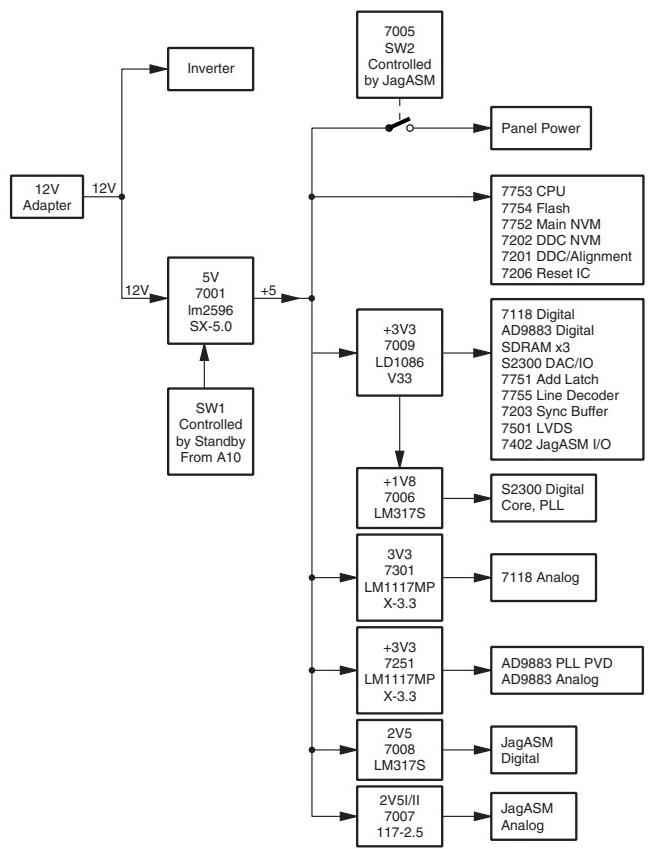
The Painter, ROM, and RAM are supplied with 3.3 V, which is also present during STANDBY.

The NVM (Non Volatile Memory) is used to store the settings, the flash-RAM contains the set software and the DRAM (located inside the microprocessor) is capable for storing 10 Teletext pages.

The sound part is built up around the MSP34xx (Multi-channel Sound Processor) for IF sound detection, sound control and source selection. Dolby decoding is also done by the MSP. Amplification is done via an integrated power amplifier IC (AN7522 for 15" and 17" models, AN5277 for 23" models).

Power supply input is a DC voltage coming from an external power adapter.

### 9.3 Power Supply



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140403

Figure 9-2 Block diagram power distribution.

#### 9.3.1 External Power Adapter

The power source for the LC03 is an **external** AC/DC adapter (not repairable). The type and power of this adapter depends on the screen size of the LCD panel and the rated audio output power. For the 15" and 17" versions, the same 12 V<sub>dc</sub> adapter is used. However, the 23" model uses an adapter with 24 V<sub>dc</sub> output.

##### Specifications for 15" and 17" models:

Power	: 12V / 5 A
Type number	: SA165A-1250V-3
Supplier	: Sino American
Ordering code	: 3139 128 76811

##### Specifications for 23" models:

Power	: 24V / 5 A
Type number	: CD3591
Supplier	: PI Electronic
Ordering code	: 3139 128 76771

#### 9.3.2 Internal Power Distribution

For the internal power distribution, the following regulators are used:

- Low power supply regulator LM2596T-5: working frequency 150 kHz, switch current 3 A, max. input voltage 40 V, max. output voltage 5 V.
- Low power supply regulator MC34063A: working frequency 24 - 42 kHz, switch current 1.5 A, max. input voltage 40 V.

The supply voltages for the TV board are derived via three MC34063A voltage regulators.

**Standby:** The STANDBY line (active "low") comes from the microprocessor and pulls the gate of FET 7900 to ground when activated. This will block the FET. Directly after this FET, a fuse (1903) is located.

**Power down:** When the DC voltage from the external adapter drops below a certain value, the POWER\_DOWN line will inform this to the microprocessor (active "low").

## 9.4 Input/Output

The I/O is divided over two parts: Rear I/O and Side I/O. The rear has two SCART inputs, a PC (VGA) input, and a HD (YPbPr) input. The side has only a SVHS input.

**EXT1:** The input of SCART1 is CVBS + RGB + L/R and the output is the video (+ sound) signal from the tuner (CVBS\_TER\_OUT).

**EXT2:** The input of SCART2 is Y/C + CVBS + L/R. The output signal is CVBS\_SC2\_MON\_OUT (+ sound).

SCART2 is meant for VCR and has therefore some additional signals in relation to EXT1 but no RGB: it has the possibility for Y/C\_in and Easylink-Plus (P50): Y\_in on pin 20 and Chroma\_in on pin 15.

Easylink is handled via pin 10 of the SCART2 (this is a bi-directional communication with the microprocessor) and supports the next features:

- Signal quality and aspect ratio matching
- One touch play & text
- PIP
- Pre-set download
- WYSIWYR
- Automatic Standby
- Country and language installation
- System Standby
- Intelligent set top box features
- NexTView download
- Timer record control
- VCR control feature

The selection of the external I/O's is controlled by the Painter microprocessor (pins 16 & 55) and handled via IC7401:

- SEL-MAIN-R1R2 is the selection between SCART1 (R1) and SCART2 (R2).
- SEL-FRNT-RR selection is made between Side and Rear I/O.

The status signals (on SCART pin 8) and Front detection are fed to the Painter (pins 2, 4 and 6).

**PC (VGA) in:** This input is directly going to the Scaler board. See paragraph "Video: Scaler Board".

**HD (YPbPr) in:** This input is directly going to the Scaler board. See paragraph "Video: Scaler Board".

## 9.5 Tuner and IF

### 9.5.1 Tuner (diagram A3, A4, and A5)

A Philips UR1336MK3 Tuner with second input (for FM Radio) is used in the TV board. The SIF FM signal is decoded by the Micronas IC.

The tuner is I2C controlled, and is capable of receiving off-air, S- (cable) and Hyperband channels channels.

Tuning is done via I2C. The reference voltage on pin 9 is 7.1 V. This voltage is derived from the +5 V via a DC/DC converter.

#### Video IF amplifier

The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. One for filtering IF-video (1452, or 1453 in case of system L/L') and one for IF-audio (1454). The type of these filters is depending of the standard(s) that has to be received.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 7 of the BOCMA to pin 1 of the tuner. The AGC-detector operates on top sync and top white level. AGC take-over point is adjusted via the service alignment mode 'Tuner' - 'AGC'. If there is too much noise in the picture, then it could be that the AGC setting is wrong. The AGC-setting could also be mis-aligned if the picture deforms with perfect signal; the IF-amplifier amplifies too much.

An (alignment free) PLL carrier regenerator with an internal VCO demodulates the video signal. This VCO is calibrated by means of a digital control circuit, which uses the clock frequency of the microprocessor as a reference. The frequency setting for the various standards is realised via the I2C-bus. The AFC output is generated by the digital control circuit of the IF-PLL demodulator and can be read via the I2C-bus.

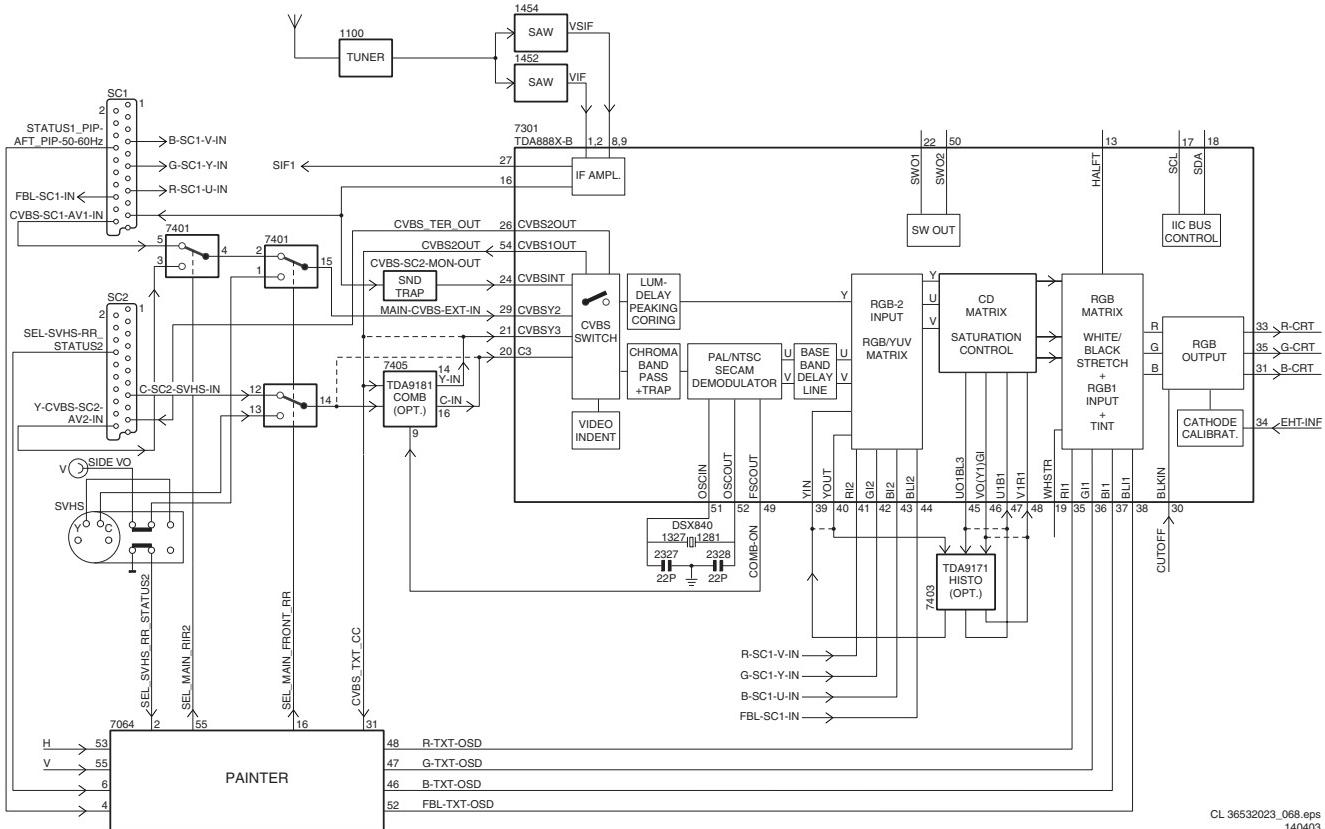
The video identification circuit is used to identify the selected CBVS or Y/C signal. The IC contains a "group delay correction" circuit, which can be switched between the BG and a flat group delay response characteristic. This has the advantage that in multi-standard receivers no compromise has to be made for the choice of the SAW filter. Also, the sound trap is integrated. The centre frequency of the trap can be switched via the I2C-bus. The signal is available on pin 27.

#### QSS sound circuit

The single reference QSS mixer is realised by a multiplier. In this multiplier, the SIF signal is converted to the intercarrier frequency by mixing it with the regenerated picture carrier from the VCO. The mixer output signal is supplied to the output via a high-pass filter for attenuation of the residual video signals. With this system, a high performance hi-fi stereo sound processing can be achieved.

The AM sound demodulator is realised by a multiplier. The modulated sound IF signal is multiplied in phase with the limited SIF signal. The demodulator output signal is supplied to the output via a low-pass filter for attenuation of the carrier harmonics. The AM signal is supplied to the output (pin 27) via the volume control.

## 9.6 Video: TV-board (diagrams A4 and A5)



**Figure 9-3 Block diagram video processing**

The video processing is completely handled by a one-chip video processor: the TDA888x. This IC is called BOCMA (Bimos One Chip Mid-end Architecture) and contains:

- IF demodulator.
  - Chrominance decoder
  - Sync separator.
  - Horizontal & vertical drive.
  - RGB processing.
  - CVBS and SVHS source select.

It has also build in features like:

- CTI.
  - Black stretch.
  - Blue stretch.
  - White stretch.
  - Slow start up.
  - Dynamic skin tone correction etc.

Further, it also incorporates sound IF traps and filters, and requires only one crystal for all systems.

### 9.6.1 Source selection

The BOCMA has an input for the internal CVBS signal and two inputs for external CVBS or Y signals. The circuit has only one chroma input so that it is not possible to apply two separate Y/C inputs.

The selection of the various sources is made via the I2C-bus. The used IC version has two independently switchable outputs:

- The CVBS1 output (pin 54) is identical to the selected signal that is supplied to the internal video processing circuit and is used as source signal for the teletext decoder (Painter). Both CVBS outputs have an amplitude of 2.0 V<sub>pp</sub>.
  - The CVBS2 output (pin 26) is fed to pin 19 of SCART2 for WYSIWYR (What You See Is What You Record).

If the Y3/C3 signal is selected for one of the outputs, the luminance and chrominance signals are added so that a CVBS signal is obtained again.

### **9.6.2 Analogue Comb filter**

After the selection of the external signals (EXT1, EXT2 or Side I/O) is made, the Y/CVBS signal is fed to the TDA888x (pin 29) along with the Front-end signal (pin 24). The selection between the two is made in the BOCMA and the output (pin 26) is fed to the (optional) 2-line comb filter (to separate the luminance from the chroma). The comb filter output is again fed to the BOCMA (pin 21) for further processing.

The external colour signals are also fed to the comb filter. In SVHS mode the comb filter is bypassed and the external signals are directly fed to the BOCMA.

signals are directly fed to the BOCMA. Switching the comb filter is done via pin 49 of IC7301. The "video standard" selection is done via the SYS1 and SYS2 signals from the microprocessor. If the comb filter is not used, jumpers are present and the external Y/C signals are directly fed to the pins 20, 21 of IC7301.

After this stage, the external RGB signals (from SCART) are added to pins 40 - 44.

### 9.6.3 Histogram (YUV picture improvement) IC

The demodulated video-signal can be checked on pins 40, 45, and 46 of IC7301 and is fed to pins 39, 47, and 48. In this path, the Histogram IC TDA9171 can be inserted. Without this IC, jumpers are used.

This TDA9178 can control various picture improvements: histogram processing, colour transient improvement and luminance transient improvement.

- Sets without TDA9178; for sets without TDA9178, the Dynamic Skin Tone Control, Blue Stretch, and Green Enhancement are controlled by the BOCMA.

- Sets with TDA9178: for sets with TDA9178, the Dynamic Skin Tone Control and Green Enhancement are controlled in the TDA9178. The Blue Stretch is controlled by the BOCMA and the Blue Stretch of the TDA9178 is switched off.

When the TDA9178 is used, noise reduction is also available. The action of the noise reduction has also influence on the sharpness control: if a noisy signal is received then the noise reduction should be high and sharpness low and vice versa.

#### 9.6.4 Chroma and Luminance processing

The BOCMA (IC7301-B) contains a chroma bandpass and trap circuit (including a luminance delay line and the delay for the peaking circuit). The centre frequency of the chroma bandpass filter is switchable via the I<sub>2</sub>C-bus so that the performance can be optimised for 'front-end' signals and external CVBS signals.

#### 9.6.5 Colour decoder

The colour decoder (demodulator) can decode PAL, NTSC, and SECAM signals. The internal clock signals for the various colour standards are generated by means of an internal VCO, which uses the 12 MHz crystal (item 1330) frequency as a reference.

Under bad-signal conditions (e.g. VCR-playback), it may occur that the colour killer is activated although the colour PLL is still in lock. When this killing action is not wanted it is possible to overrule it.

The IC contains an Automatic Colour Limiting (ACL) circuit, which is switchable via the I<sub>2</sub>C-bus, and which prevents that over saturation occurs when signals with a high chroma-to-burst ratio are received.

The reference frequency of the colour decoder is fed to the FSC output (pin 49) and can be used to tune an external comb filter.

The base-band delay line is integrated. The demodulated colour difference signals are internally supplied to the delay line. The colour difference matrix switches automatically between PAL/SECAM and NTSC.

#### 9.6.6 Picture improvement features

In the BOCMA, various picture improvement features have been integrated. These features are:

- Video dependent coring in the peaking circuit. The coring can be activated only in the low-light parts of the screen. This effectively reduces noise while having maximum peaking in the bright parts of the picture.
- Colour Transient Improvement (CTI). This circuit improves the rise and fall times of the colour difference signals.
- Black-stretch. This circuit corrects the black level for incoming video signals, which have a deviation between the black level and the blanking, level (back porch).
- Blue-stretch. This circuit is intended to shift colour near 'white' with sufficient contrast values towards more blue to obtain a brighter impression of the picture.
- White-stretch. This function adapts the transfer characteristic of the luminance amplifier in a non-linear way dependent on the picture content. The system operates such that maximum stretching is obtained when signals with a low video level are received. For bright pictures, the stretching is not active.
- Dynamic skin tone (flesh) control. This function is realised in the YUV domain by detecting the colours near to the skin tone. The correction angle can be controlled via the I<sub>2</sub>C-bus.

#### 9.6.7 RGB output

The ICs have a flexible control circuit for RGB and YUV input signals which has the following features:

- Input, which can be used for YUV or RGB, input signals and as YUV interface. The selection of the various modes can be realised via the I<sub>2</sub>C-bus. For the YUV input 2 different input signal conditions can be chosen. It is also possible to connect the synchronisation circuit to the incoming Y input signal. This input signal can be controlled on saturation, contrast, and brightness.
- The RGB-1 input which is intended for OSD/text signals and which can be controlled on contrast and brightness. By means of software, the insertion blanking can be switched "on" or "off". It is also possible to convert the incoming RGB-1 signal to a YUV signal. The resulting signal is supplied to the YUV outputs.
- The TDA888x versions have an additional YUV or RGB input which can be controlled on contrast, saturation, and brightness. This signal is supplied to the control circuit via the YUV interface so that an external picture improvement IC will also have effect on this signal.

#### 9.6.8 Synchronisation (diagrams A4 and A5)

##### Horizontal Sync (H Sync)

Before the video processor IC7301 can generate horizontal drive pulses (LINEDRIVE, pin 56), the supply voltages on both pins 23 and 53 must be present. After the start-up command of the Painter (via the I<sub>2</sub>C), the BOCMA starts giving horizontal pulses.

##### Vertical Sync (V Sync)

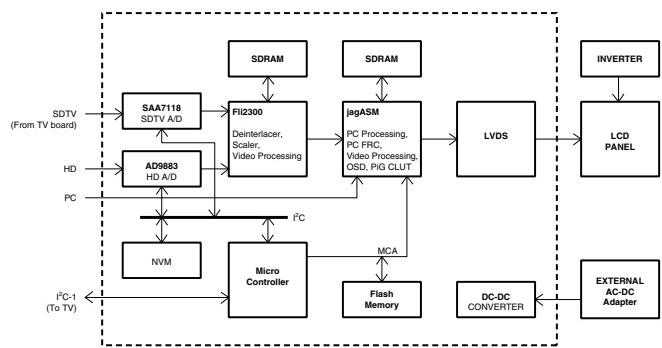
The vertical sawtooth generator drives the vertical output drive circuit. On pins 63 and 64 are two differential voltages DR+ and DR-. For this chassis, only DR- is used. This line is called V-SYNC, and goes to the Painter microprocessor.

##### Composite Sync (C Sync)

On pin 57 of IC7301 the sandcastle pulse (SC) is available. This is a 2-state pulse that is used for synchronisation of the (optional) histogram IC (item 7403). Together with the LINEDRIVE pulse, this signal is also used to create the C-SYNC signal, which is used to synchronise the Scaler board.

#### 9.7 Video: Scaler Board

The Scaler Board controls the display processing in an LCD TV, e.g. like the deflection circuit in a CRT-based TV. It controls all the view modes (e.g. like "zooming" and "shifting"). Features like PC (VGA) or HD inputs, are also handled by this board.



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Figure 9-4 Block diagram Scaler board

### 9.7.1 Inputs

#### PC (VGA) input specifications

- RGB Video:** 0.7 V<sub>pp</sub>, positive polarity (negative pin via 136 Ohm resistor to ground).
- Separate Sync (H, V):** TTL level, positive or negative polarity. One loop goes via two inverters to the Scaler IC (JagASM); the other loop goes directly to the Painter microprocessor on the TV board for VGA detection. If no H or V sync is detected after 3 s, the set will go to standby.
- DDC NVM:** This chip provides the PC with identification info (e.g. type, support PC mode, LCD panel timing, etc.), when the TV is used as a PC monitor. It is directly connected to the VGA port.
- Reset circuit:** When the power is switched “on”, the RESET line will go “high” for 240 ms, and then turn to “low” for normal operation. To reset the Scaler IC, this signal is inverted (RESET#).

#### HD (YPbPr) input specifications

Input via Scaler Board. Supports:

- 576p, 720p and 1080i for PAL
- 480p, 720p, and 1080i for NTSC.
- Sync Detection: SOG/SOY and YUV/RGB supported.

### 9.7.2 Video Converter: Fli2300

This 208-pins BGA-IC creates a picture signal with double the scan lines of a conventional interlaced picture, to create a

noticeably sharper and smoother image. It offers higher picture resolution and eliminates virtually all motion artefacts. Even on large screens, the progressive scan lines are barely noticeable and it reduces picture flickering significant.

Below listed processing is done in the Fli2300:

- HD/SDTV brightness, saturation, hue, and sharpness control.
- Noise reduction and de-interlacing (only for SDTV).
- Scaling
- DAC RGB output for fault finding (on connector 1352)

### 9.7.3 Scaler: JagASM

This IC is a highly integrated display processor with advanced analogue and digital signal processing.

The JagASM is a 388-ball PBGA device. It has 352 balls for signals, power and ground and a centre matrix of 36 balls. These centre matrix balls are used as thermal connections for better heat dissipation.

Below listed processing is done in the JagASM:

- Colour temperature and White-D control.
- SD/HD/PC contrast control.
- PC input ADC.
- PC related processing.
- Scaling and Frame Rate Conversion for PC.
- Picture In Graphic (PIG) processing.
- OSD for HD and PC mode.

## 9.8 Audio Processing

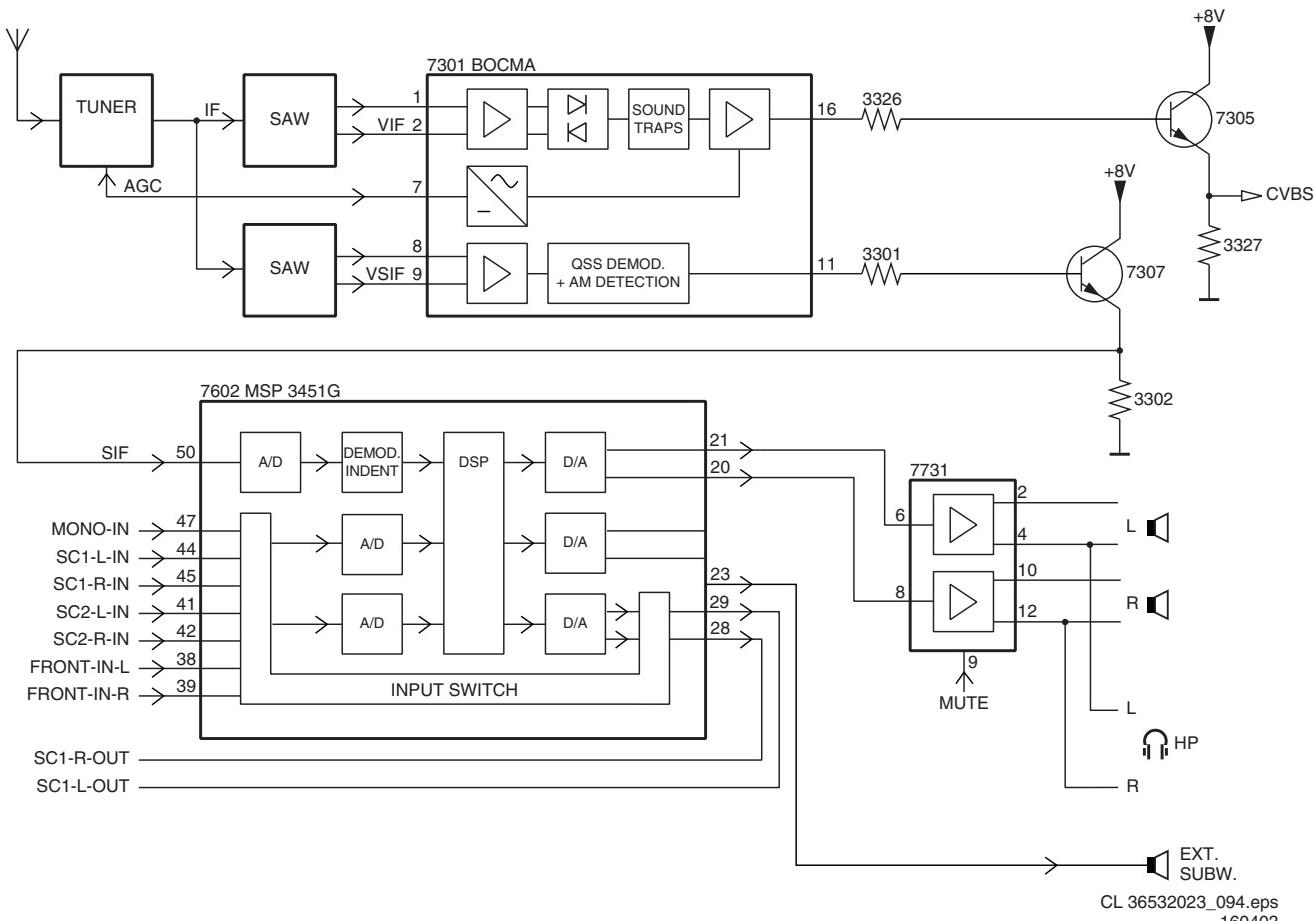


Figure 9-5 Block diagram audio processing

### 9.8.1 Introduction

All sets contain one of ITT's Multistandard Sound Processing ICs for sound decoding:

- MSP3410 (or 3411): Multi System (incl. NICAM) decoding for Europe and AP (Virtual Dolby).
- MSP3421 (or 3421): BTSC decoding for NAFTA and LATAM (Virtual Dolby).

This IC takes care of the main FM, AM and NICAM sound decoding.

The analogue input and output sections of MSP offer wide range of switching facilities such that it is possible to distribute all possible source signals (internal and external) to the desired output channels (main, headphone or SCART outputs).

All MSP versions contain digital audio processing, used for the basic left/right stereo sound, such as bass, treble, balance, incredible sound and spatial and source selection (SIF-signal, EXT1 or EXT2).

In addition to that, the MSP34x1 versions are also able to perform Virtual Dolby, a Dolby approved sound mode for surround sound reproduction with left/right speakers only.

### 9.8.2 Source selection

**Table 9-1 MSP overview**

Micronas IC	System	Virtual Dolby	Region
MSP3410G	Multi-system	No	Europe/AP
MSP3411G	Multi-system	Yes	Europe/AP
MSP3420G	BTSC	No	Nafta/Latam
MSP3421G	BTSC	Yes	Nafta/Latam

The above-mentioned Micronas ICs are all having four pairs (L/R) of SCART audio inputs. The fourth input pair (AV4) is used as audio-in (input cinches located at the Scaler board) for PC and HD modes.

To get a constant level output if the Tuner is selected, the SCART1 output (Tuner at any time) has to be fed back to the input selector and selected as input for the MSP (SCART1 input).

### 9.8.3 Audio decoding

At the input, a choice can be made between two IF-signals; SIF and SIFM.

The selected signal is fed to the AGC. After this, an ADC converts the IF-signal to digital.

This digital signal can be processed by two demodulation channels. The first one is able to handle FM and NICAM signals. The second one can handle FM and AM signals. Each channel contains a mixer to shift the incoming signal in the frequency domain. This shift is determined by the value of a DCO (Digital Controlled Oscillator).

After the down-mix, the signal is fed, via a filter, to a discriminator. From here the AM, FM or NICAM demodulation can be performed.

Both channels contain an 'automatic carrier mute' function, which automatically mutes the output of the analogue section when no carrier is detected.

After demodulation, the FM-signals are subjected to a de-emphasis operation. After that, the matrix of the stereo system is applied.

### 9.8.4 Audio processing

The sound processing is completely done by the MSP34xx:

- **Volume control** is done by the user via the SOUND menu.
- **Tone control** in 'Stereo' sets is done via the BASS/TREBLE control.
- **Headphone control** in 'Stereo'-sets is done via the loudspeaker output of the amplifier.

In 'Virtual Dolby'-sets, the MSP has a separate Headphone output so separate sound control is possible.

- **Mute control** can be done in different ways:
  - System muting. System muting is implemented for "special events" such as channel/source change event, loss of identification signal, on/off of set, during search and auto store/program, sound mode change. This muting is transparent to the user. Audio output should be muted before the above "special events" occurred, to prevent problems such as audible plop. Muting is done via the SOUND-ENABLE line (active "low") connected to the amplifier-IC and coming from the Painter.
  - Headphone status mute. A headphone status is available to detect the presence of the headphone and mute the main speakers if the headphone is detected. The microprocessor will read the HP-SIDE-DETECT status.
  - User muting. This is a mute option available to the user. The user select the MUTE option on the remote control to switch off/on the sound output to the main loudspeaker and the subwoofer.

### Automatic Volume Levelling (AVL)

One of the features of the MSP-family is AVL. If used, it limits the big volume differences in the broadcast between e.g. news transmissions and commercials or within a movie.

To be able to get a Dolby approval (for the Virtual Dolby sets), the AVL feature must be switchable. Therefore, the AVL feature is customer switchable via the menu.

### 9.8.5 Audio amplification (diagram A9)

Some specifications:

- 15" and 17" models: 2 x 3 W with power amplifier AN7522N.
- 23" models: 2 x 5 W with power amplifier AN5277N.
- All models are equipped with a subwoofer output.

The audio output stage is built around IC7731, which is a balanced amplifier, and is located on the TV board. It uses a monolithic integrated power amplifier IC, the AN5277. The gain of the amplifier is constant. This means that volume control has to be done via the MSP.

The supply voltage is 12 V/24 V depended on screen size, generated by the power supply via L5733

The AN5277 delivers an output of 2 x 10 W\_RMS to two full range speakers. A subwoofer is not implemented.

### Headphone Amplifier

The headphone outputs are from the same audio power amplifier. The headphone jack will disconnect the audio output to the speakers when a headphone plug is inserted. Hence, the speakers are muted if a headphone is connected.

### Protection

This two resistors are to limit the audio output to HP.

### 9.8.6 Audio: Lip Sync

A "lip sync" circuit with an 80 ms audio delay is added, in order to synchronise with video delay due to the complexity of the display processing. See table:

**Table 9-2 Lip sync overview**

Input	Speaker out(delay)	Monitor out(delay)	SCART1 out(delay)	SCART2 out(delay)
AV1	AV1 (80 ms)	AV1 (80 ms)	RF (none)	AV1 (80 ms)
AV2	AV2 (80 ms)	AV2 (80 ms)	RF (none)	RF (none)
AV3	AV3 (80 ms)	AV3 (80 ms)	RF (none)	AV3 (80 ms)
AV4	AV4 (80 ms)	AV4 (80 ms)	RF (none)	AV4 (80 ms)
RF	RF (80 ms)	RF (80 ms)	RF (80 ms)	RF (80 ms)

The video delay is significant, due to memory based processing. For instance, the "frame rate conversion" cause a delay of two frames, while the LCD panel response also cause a delay.

The circuit is a (16 bit) FIFO based digital delay. The memory size required for a 80 ms delay (with a data clock of 1.024 MHz) can be calculated with: Memory size = delay time \* f\_clk. This gives: 80 ms \* 1.024 MHz = 81920 bits.

To calculate the memory size for a 16 bits mode I2S digital audio stream we must use the following data:

- f\_s = 32 kHz, 16 bits, stereo
- Data clock = 32 kHz \* 16 \* 2 = 1.024 MHz
- Memory size for 1 ms delay = 1 ms \* 1.024 MHz = 1024 bits = 1 kbit

So, the delay time of 80 ms can be built with five steps of 16 ms, which is close to the frame rate. Therefore, a 128 kbit SRAM (16 x 8) is chosen.

## 9.9 Control

### 9.9.1 Painter

The microprocessor (SAA55xx, IC7064 called Painter) provides:

- Control functions for the TV-set.
- On Screen Display (OSD).
- Teletext functions.
- P50 (Easylink) communication.
- I/O-ports for I2C, RC5, LED, and service modes.
- Error code generation.

Ten pages TXT-data can be stored internally. For 100 pages, an external memory is used (IC7070).

The Non Volatile Memory IC7066 is a 4 kB version M24C32W6.

All ICs in this part are supplied with 3V5 that is also present during Standby. This voltage is supplied via voltage regulator IC7920.

For stable OSD and TXT, the display is synchronised to the TV signal processing device by way of horizontal and vertical sync signals provided by external circuits (H-SYNC and V-SYNC). From these signals, all display timings are derived.

The OSD/TXT RGB-outputs (46/47/48) and fast blanking (52) are fed to the BOCMA (pins 35 - 38).

### 9.9.2 I2C-busses

In this chassis, two I2C-busses used:

- Hardware I2C-bus, used for all IC communication.
- Separate short bus for the Non Volatile Memory (NVM), to avoid data corruption.

### 9.9.3 NVM

The Non Volatile Memory IC7066 contains all set related data that must be kept permanently, such as:

- Software identification.

- Operational hours.
- Error-codes.
- Option codes.
- All factory alignments.
- Last Status items for the customer + a complete factory recall.

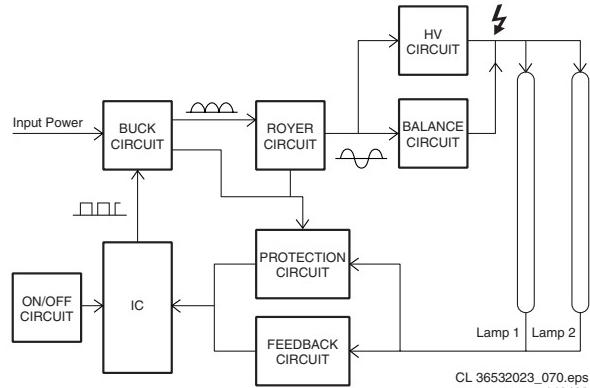
### 9.9.4 Light control

A pair of light sensors, at the Front Control panel, is used to monitor the external ambient light condition and adjust the brightness, contrast, and any relevant video parameters of the display.

## 9.10 Inverter

1. Introduction
2. Control
3. Buck Converter
4. Royer Circuit
5. HV Circuit
6. Balance Circuit
7. Feedback Circuit
8. Protection Circuit

### 9.10.1 Introduction

**Figure 9-6 Block diagram Inverter Circuit**

This is a separate panel (separate from LCD) for the 15" and 17" models, but is built-in in the 23" LCD panel.

This circuit is a basic DC/AC inverter for driving Cold Cathode Fluorescent Lamps (CCFL), who are located behind the LCD panel.

### 9.10.2 Control

The "On/Off circuit" delivers an input signal to turn the AC output voltage "on" or "off":

- ON  $\geq 2.5$  V
- OFF  $\leq 2.0$  V

This signal switches transistor Q4 "on/off", resulting in "start/stop" of the buck converter.

### 9.10.3 Buck Converter

This circuit uses the Power MOSFET (item Q8) to control the input power for the Royer circuit. It is based on the "Buck Converter" principle. The transistor switch (Q8) is the heart of the buck converter, and it controls the power supplied to the load. It is controlled via a PWM controller (U1, LM339). The LM339 controls the lamp current and brightness. Its functions include burst mode control, PWM control, and "soft start".

**Note:** this circuit needs a minimum load, in order to work properly.

#### 9.10.4 Royer Circuit

This is a standard Royer structure. It transfers the DC input signal into an AC output signal. It is a self-resonant oscillator, where one transistor conducts current while the opposite one does not, and vice versa. The transformer core saturates in each half cycle, causing each transistor to switch "on" or "off". The energy required to operate the transistors as switches is supplied by the feedback windings of the transformer to the bases of the transistors. The resistors R19 and R20 supply the base current for Q5 and Q6. Capacitor C10/C11 and transformer T1 define the oscillation frequency (working frequency). For the 15" model, the working frequency lies around 45 kHz, for the 17" model, this is about 47 kHz.

**Example:** If the primary voltage is 15 V<sub>rms</sub>, and the transformer turn ratio is 100, the secondary voltage is about 15 \* 100 = 1500 V<sub>rms</sub>.

#### 9.10.5 HV Circuit

The High Voltage (HV) circuit supplies the power to drive the lamps. The output voltage () is:

- 15" model: 520 V (with load), 1189 V (without load).
- 17" model: 609 V (with load), 1257 V (without load).

**Note:** Ensure that the backlight connectors are fully inserted, in order to prevent high voltage arcing.

#### 9.10.6 Balance Circuit

The Balance circuit uses an LCR resonant mode, to control the output current. It delivers the same output current, even if the load is different.

#### 9.10.7 Feedback Circuit

The sense voltage of the feedback circuit is set at half the 5 V supply voltage via R15 and R17 (at pin 9 of the comparator). The control IC compares this voltage with the output current, and regulates the PWM drive signal.

#### 9.10.8 Protection Circuit

The protection circuit senses the output for current and for abnormal signal behaviour, in order to protect the inverter:

- **Output current:** It monitors the lamp current. If this current is correct, the inverter will operate continuous. If the current is incorrect, the inverter will be shut down. This means for instance that if one lamp is not working, the inverter will go into protection.
- **Note:** Be sure that the lamp connectors are connected properly.
- **Abnormal signals:** It monitors the signals from the PWM and Royer stage. If anything is wrong, the protection circuit will shutdown the inverter.

### 9.11 LCD Display

#### 9.11.1 Specifications

Panel model	: LC151X01-C3P1 (15") : LM171W01-B3 (17") : LC230W01-A2 (23") : 1024x768 pixels (15") : 1280x768 pixels (17") : 1280x768 pixels (23")
Resolution (HxV)	
Luminance	: 400 nit (15") : 400 nit (17") : 450 nit (23")
Contrast ratio	: 350 (15") : 350 (17") : 400 (23")
Supplier	: LG.Philips LCD

## 9.11.2 LCD Failure Modes

Figures below can be used to evaluate problems with the LCD display.

Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility	
TCP	V B/D	Block defect (Entire TCP defect)		Block defect : TCP crack or chip broken	- Can find damaged mark
	V Dim	Dim line		Dim or L/D : TCP dent(External stress) : TCP lead crack : Conductive particle inside ACF bonding area : Conductive particle induced from outside of LCD or due to improper condition : Mis-align between TCP & panel : Panel defect : TCP malfunction	- Can find damaged mark - Can find damaged mark
	V L/D	Vertical line defect (Always bright or dark)		(A) Chip broken (B) TCP crack (C) TCP dent (D) Conductive particle inside ACF bonding area (E) Mis-align btwn TCP & panel	- Easy to find out responsibility with ingredient analysis for conductive particle
	H B/D	Block type defect (Entire TCP defect)		<b>Customer responsibility</b> (Regardless of the No. of defective line) : In case of damaged marks such as TCP dent or chip broken : TCP crack due to interference with customer system : Mutually agreed defect as customer's responsibility	
	H Dim	Dim line		<b>Supplier responsibility</b> (Regardless of the No. of defective line) : The others	
	H L/D	Vertical line defect (Always bright or dark)			

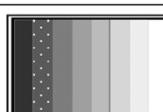
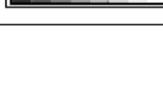
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Figure 9-7 LCD failure modes (1)

Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Panel or Polarizer	Dot Defect	Panel has bright or dark dot. Sometimes adjacent 2 dot		Malfunction of TFT inside panel. - Follow IIS(Incoming Inspection Standard)
	Polarizer Bubble	Polarizer has bubbles		Bubble between upper glass and polarizer. - Follow IIS(Incoming Inspection Standard)
	Polarizer Scratch	Polarizer has scratch		Hard or sharp tool made this defect. - Follow IIS(Incoming Inspection Standard)
	F/M inside Polarizer	Foreign material inside polarizer. It shows linear or dot shape.		Foreign material inside polarizer. - Follow IIS(Incoming Inspection Standard)
	Yellowish /Purplish	Some area is different on white screen		1. Panel gap between upper and down layer glass is not uniform 2. Liquid crystal deteriorated 3. Limit sample
	Mura/ Mottling	Small area/ spot of un-uniformity /		1. Panel gap between upper and down layer glass is not uniform 2. Limit sample

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Figure 9-8 LCD failure modes (2)

Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Panel or Polarizer	New Ring	Ringed brightness uneven		Cell gap is not uniformity
	Chromaticity shift	Color coordinates is deviation		Transmittivity of panel declined (cell gap declined)
Circuit	Noise on grayscale	Noise on grayscale bar		Frame convertor IC(GMZ1) abnormal output(monitor system problem)
	Picture waving	Foreign material inside polarizer. It shows linear or dot shape.		Drive IC output is not stable (interference)
	Abnormal Display	Any kind of abnormal display except vertical or horizontal block defect.		1. Malfunction of any chipsets inside LCM - Customer responsibility 2. mechanical or electrical stress from customer system after analysis. - customer responsibility 3. Cold/short soldering of any components - Supplier responsibility 4. Poor connection between LCD and customer system. - Customer responsibility
	Flashing	Bright and dark display by turns.		

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Figure 9-9 LCD failure modes (3)

Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Circuit	White Screen	LCD displays only white screen when B/L is normal condition. It corresponds to normally white mode.		1. LCD Fuse would be open because of surge current need to check compatibility 2. LCM cable no connecting (normal white)
	Black Screen	LCD displays only black screen when B/L is normal condition. It corresponds to normally black mode.		1. LCD Fuse would be open because of surge current need to check compatibility 2. LCM cable no connecting (normal Black, IPS)
	Flicker	LCD flickers at special pattern.		1. Vcom voltage in LCD is not balanced well - supplier responsibility but it can re-adjustable.
	Crosstalk	Brightness is different due to crosstalk at the pattern for crosstalk check.		1. An un-desired, parasite capacitance inside LCD panel can make vertical or horizontal crosstalk. All LCDs have weak crosstalk inevitably. But most of weak crosstalks are difficult to distinguish, especially with naked eye. 2. Follow IIS spec.
	Abnormal Color	LCD operate normally except different color.		1. Malfunction of any chipsets inside LCM-- Supplier responsibility 2. Mechanical or electrical stress from customer system after analysis- Customer responsibility 3. Cold/short soldering of any components-- supplier responsibility 4. Poor connection between LCD and customer system -- customer responsibility
	Saturation	Higher grayscale bars is mixed (on 32 grayscale pattern)		1. Drive IC DC level is not correct 2. Monitor system improper adjustment on sub_contrast/sub_bright

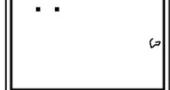
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Figure 9-10 LCD failure modes (4)

Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
<b>Mechanical or B/L</b>	<b>Mechanical Noise</b>	Mechanical noise heard when twisted.		Mechanical interference in back light unit. - Needs limit sample
	<b>Ripple</b>	Concentric circle formed		Mechanical interference between panel and any mechanical structure including back light unit, customer's connector or front bezel effects cell gap of the LCD. As a result, Concentric circle observed. - Mechanical Interference : need to co-work
	<b>B/L off</b>	B/L is not working without any damaged in appearance		1. Cold soldering between wire and lamp electrode supplier responsibility 2. Lamp broken -- Customer responsibility
	<b>B/L dark</b>	B/L is darker than normality		1. Cold soldering between wire and lamp electrode. 2. Intermittent short between wire and lamp housing. Supplier responsibility
	<b>B/L wire damaged</b>	B/L wire damaged		Mis handling or any interference with customer system - Customer responsibility
	<b>B/L wire open</b>	No B/L		Mis handling or any interference with customer system - Customer responsibility
	<b>B/L shutdown</b>	B/L shutdown after a period of time		Intermittent short between wire and lamp housing happened because the power consumption is over than capacity of B/L inverter. - LG.PHILIPS LCD responsibility
	<b>F/M</b>	B/L has foreign material. Black or white color, linear or circular type		Foreign material inside B/L unit - Depend on IIS(Incoming Inspection Standard)

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Figure 9-11 LCD failure modes (5)

Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
<b>Mechanical or B/L</b>	<b>Mechanical Noise</b>	Mechanical noise heard when twisted.		Mechanical interference in back light unit. - Needs limit sample
	<b>Ripple</b>	Concentric circle formed		Mechanical interference between panel and any mechanical structure including back light unit, customer's connector or front bezel effects cell gap of the LCD. As a result, Concentric circle observed. - Mechanical Interference : need to co-work
	<b>B/L off</b>	B/L is not working without any damaged in appearance		1. Cold soldering between wire and lamp electrode supplier responsibility 2. Lamp broken -- Customer responsibility
	<b>B/L dark</b>	B/L is darker than normality		1. Cold soldering between wire and lamp electrode. 2. Intermittent short between wire and lamp housing. Supplier responsibility
	<b>B/L wire damaged</b>	B/L wire damaged		Mis handling or any interference with customer system - Customer responsibility
	<b>B/L wire open</b>	No B/L		Mis handling or any interference with customer system - Customer responsibility
	<b>B/L shutdown</b>	B/L shutdown after a period of time		Intermittent short between wire and lamp housing happened because the power consumption is over than capacity of B/L inverter. - LG.PHILIPS LCD responsibility
	<b>F/M</b>	B/L has foreign material. Black or white color, linear or circular type		Foreign material inside B/L unit - Depend on IIS(Incoming Inspection Standard)

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Figure 9-12 LCD failure modes (6)

## 9.12 Abbreviation list

0/6/12	SCART switch control signal on A/V board. 0 = loop through (AUX to TV), 6 = play 16:9 format, 12 = play 4:3 format		FLASH	FLASH memory
1080i	1080 visible lines, interlaced		FM	Field Memory / Frequency Modulation
1080p	1080 visible lines, progressive scan		FMR	FM Radio
2CS	2 Carrier Stereo		FRC	Frame Rate Converter
480i	480 visible lines, interlaced		FRONT-C	Front input chrominance (SVHS)
480p	480 visible lines, progressive scan		FRONT-DETECT	Front input detection
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page		FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)
ADC	Analogue to Digital Converter		G-SC1-IN	Green SCART1 in
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency		G-SC2-IN	Green SCART2 in
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box		G-TXT	Green teletext
AM	Amplitude Modulation		H	H_sync to the module
AP	Asia Pacific		HA	Horizontal Acquisition: horizontal sync pulse coming out of the BOCMA
AR	Aspect Ratio: 4 by 3 or 16 by 9		HD	High Definition
Artistic	See Painter 2.5: main processor		HP	HeadPhone
ASD	Automatic Standard Detection		I	Monochrome TV system. Sound carrier distance is 6.0 MHz
AV	Audio Video		I2C	Integrated IC bus
B-SC1-IN	Blue SCART1 in		I2S	Integrated IC Sound bus
B-SC2-IN	Blue SCART2 in		IC	Integrated Circuit
B-TXT	Blue teletext		IF	Intermediate Frequency
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz		Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.
BOCMA	Bimos one Chip Mid-end Architecture: video and chroma decoder		IR	Infra Red
C-FRONT	Chrominance front input		IRQ	Interrupt ReQuest
CBA	Circuit Board Assembly (or PWB)		Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
CL	Constant Level: audio output to connect with an external amplifier		LATAM	LATin AMerica
CLUT	Colour Look Up Table		LC03	Philips chassis name for LCD TV 2003 project
ComPair	Computer aided rePair		LCD	Liquid Crystal Display
CSM	Customer Service Mode		LED	Light Emitting Diode
CVBS	Composite Video Blanking and Synchronisation		LINE-DRIVE	Line drive signal
CVBS-EXT	CVBS signal from external source (VCR, VCD, etc.)		L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
CVBS-INT	CVBS signal from Tuner		LS	LoudSpeaker
CVBS-MON	CVBS monitor signal		LVDS	Low Voltage Differential Signalling, data transmission system for high speed and low EMI communication.
CVBS-TER-OUT	CVBS terrestrial out		M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
DAC	Digital to Analogue Converter		MOSFET	Metal Oxide Semiconductor Field Effect Transistor
DBE	Dynamic Bass Enhancement: extra low frequency amplification		MPEG	Motion Pictures Experts Group
DFU	Directions For Use: owner's manual		MSP	Multi-standard Sound Processor: ITT sound decoder
DNR	Dynamic Noise Reduction		MUTE	MUTE Line
DRAM	Dynamic RAM		NC	Not Connected
DSP	Digital Signal Processing		NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, used mainly in Europe.
DST	Dealer Service Tool: special (European) remote control designed for service technicians		NTSC	National Television Standard Committee. Colour system used mainly in North America and Japan. Colour carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
DTS	Digital Theatre Sound		NVM	Non Volatile Memory: IC containing TV related data (for example, options)
DVD	Digital Video Disc		O/C	Open Circuit
EEPROM	Electrically Erasable and Programmable Read Only Memory		ON/OFF LED	On/Off control signal for the LED
EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTVview)		OSD	On Screen Display
EU	EUrope		P50	Project 50 communication: protocol between TV and peripherals
EXT	EXternal (source), entering the set by SCART or by cinches (jacks)		PAL	Phase Alternating Line. Colour system used mainly in Western Europe
FBL	Fast Blanking: DC signal accompanying RGB signals			
FBL-SC1-IN	Fast blanking signal for SCART1 in			
FBL-SC2-IN	Fast blanking signal for SCART2 in			
FBL-TXT	Fast Blanking Teletext			

	(colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)	VCR	Video Cassette Recorder
PC	Personal Computer	VGA	Video Graphics Array
PCB	Printed Circuit Board (or PWB)	WD	Watch Dog
PIG	Picture In Graphic	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
PIP	Picture In Picture	XTAL	Quartz crystal
PLL	Phase Locked Loop. Used, for example, in FST tuning systems. The customer can directly provide the desired frequency	YPbPr	Component video (Y= Luminance, Pb/Pr= Colour difference signals)
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.	Y/C	Luminance (Y) and Chrominance (C) signal
PWB	Printed Wiring Board (or PCB)	Y-OUT	Luminance-signal
RAM	Random Access Memory	YUV	Component video
RC	Remote Control transmitter		
RC5	Remote Control system 5, the signal from the remote control receiver		
RGB	Red, Green, and Blue. The primary colour signals for TV. By mixing levels of R, G, and B, all colours (Y/C) are reproduced.		
RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync		
ROM	Read Only Memory		
SAM	Service Alignment Mode		
SIF	Sound Intermediate Frequency		
SC	SandCastle: two-level pulse derived from sync signals		
SC	Sandcastle: pulse derived from sync signals		
SC1-OUT	SCART output of the MSP audio IC		
SC2-B-IN	SCART2 Blue in		
SC2-C-IN	SCART2 chrominance in		
SC2-OUT	SCART output of the MSP audio IC		
S/C	Short Circuit		
SCART	Syndicat des Constructeurs d'Appareils Radiorecepteurs et Televisieurs		
SCL	CLock Signal on I2C bus		
SD	Standard Definition		
SDA	DAta Signal on I2C bus		
SDRAM	Synchronous DRAM		
SECAM	SEquence Couleur Avec Memoire. Colour system used mainly in France and Eastern Europe. Colour carriers = 4.406250 MHz and 4.250000 MHz		
SIF	Sound Intermediate Frequency		
SMPS	Switch Mode Power Supply		
SND	SouND		
SNDL-SC1-IN	Sound left SCART1 in		
SNDL-SC1-OUT	Sound left SCART1 out		
SNDL-SC2-IN	Sound left SCART2 in		
SNDL-SC2-OUT	Sound left SCART2 out		
SNDR-SC1-IN	Sound right SCART1 in		
SNDR-SC1-OUT	Sound right SCART1 out		
SNDR-SC2-IN	Sound right SCART2 in		
SNDR-SC2-OUT	Sound right SCART2 out		
SNDS-VL-OUT	Surround sound left variable level out		
SNDS-VR-OUT	Surround sound right variable level out		
SOPS	Self Oscillating Power Supply		
S/PDIF	Sony Philips Digital InterFace		
SRAM	Static RAM		
STBY	STandBY		
SVHS	Super Video Home System		
SW	SubWoofer / SoftWare		
THD	Total Harmonic Distortion		
TXT	TeleteXT		
uP	Microprocessor		
VA	Vertical Acquisition		
VL	Variable Level out: processed audio output toward external amplifier		

## 9.13 IC Data Sheets

This section shows the internal block diagrams and pin layouts of ICs that are drawn as "black boxes" in the electrical diagrams (with the exception of "memory" and "logic" ICs).

### 9.13.1 Diagram B1, Type UPD64083 (IC7823)

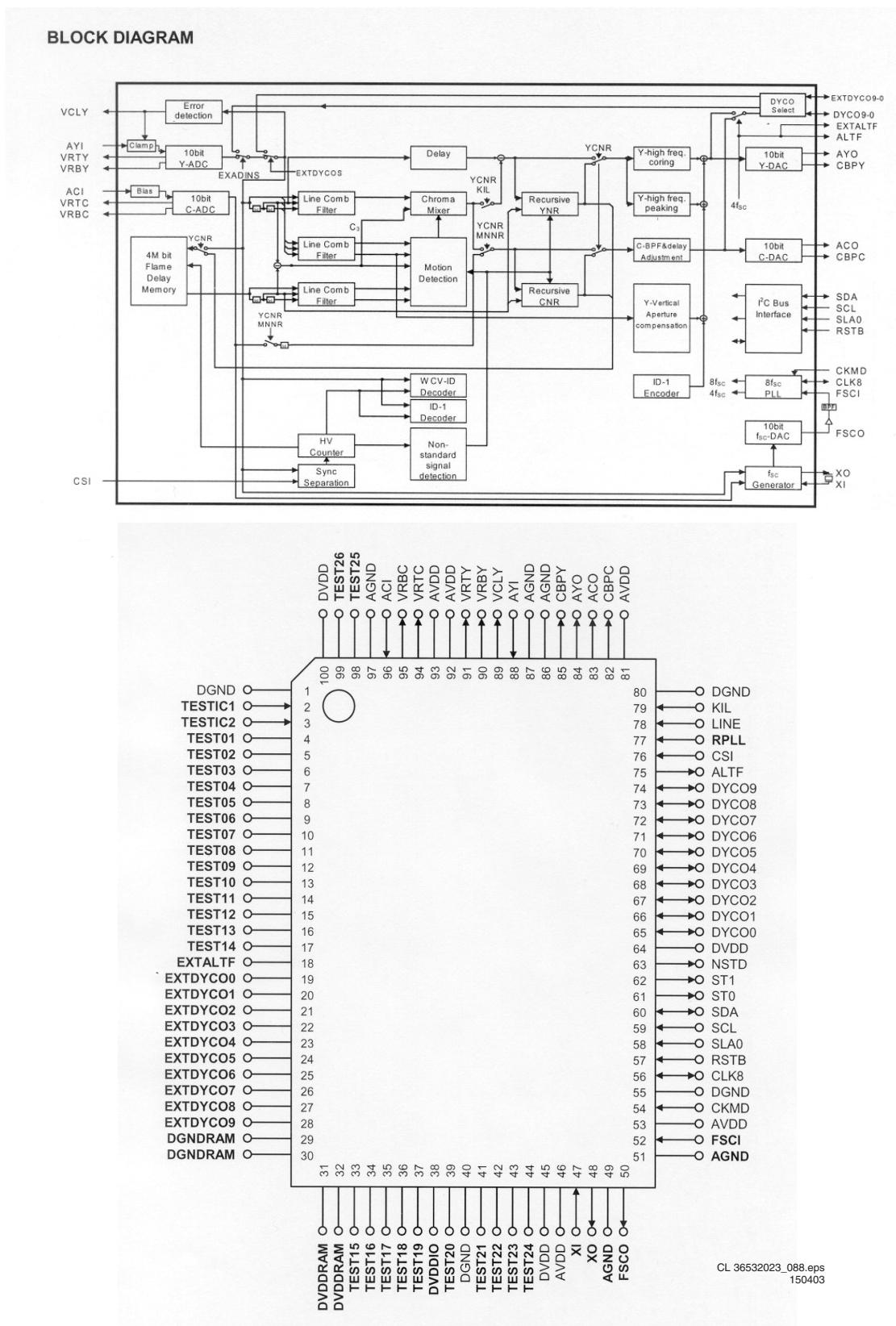


Figure 9-13 new Internal Block Diagram and Pin Layout

## 9.13.2 Diagram C4, Type JagASM (IC7402)

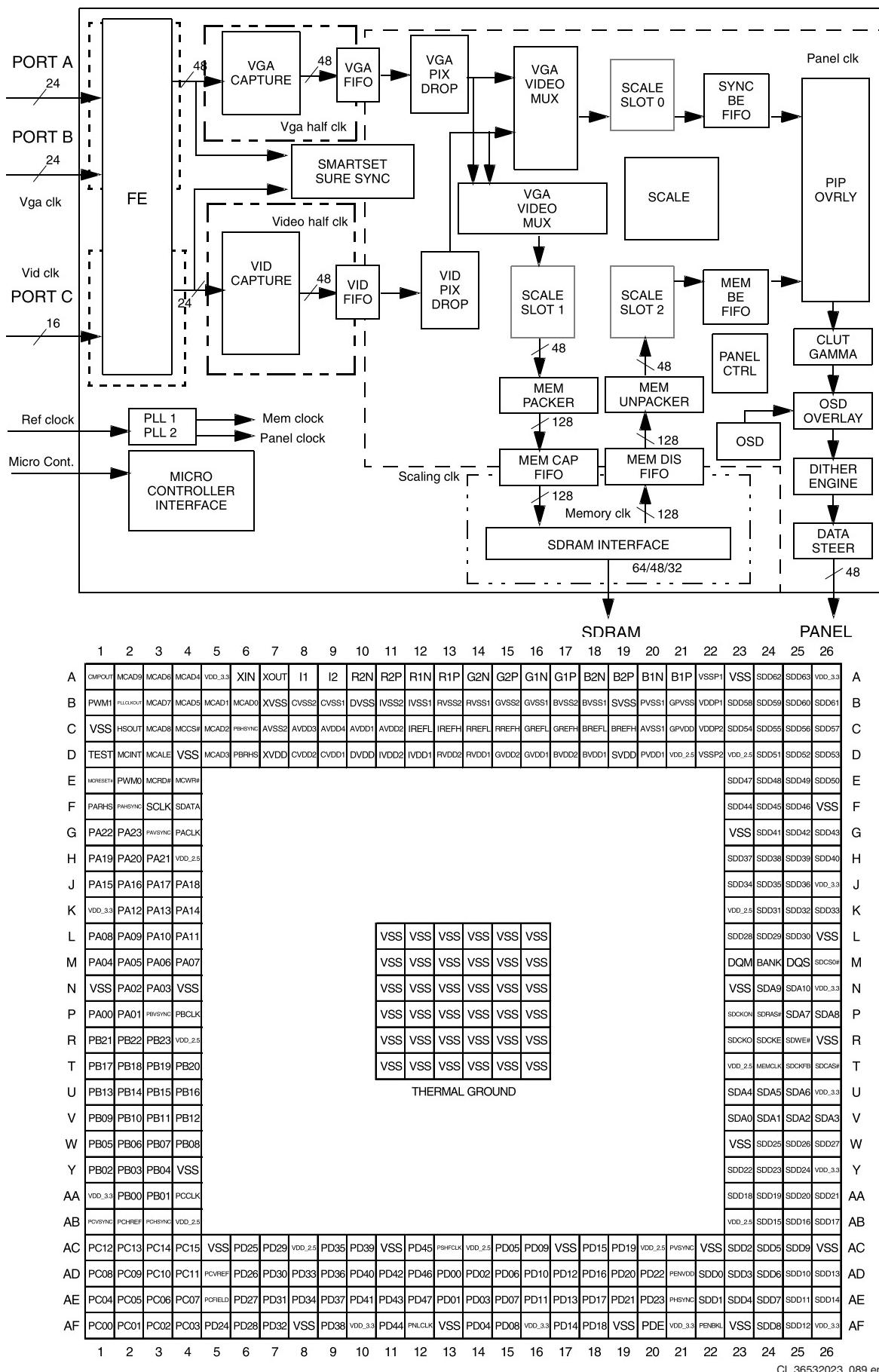


Figure 9-14 new Internal Block Diagram and Pin Layout

## 9.13.3 Diagram C9, Type Fli2300 (IC7351)

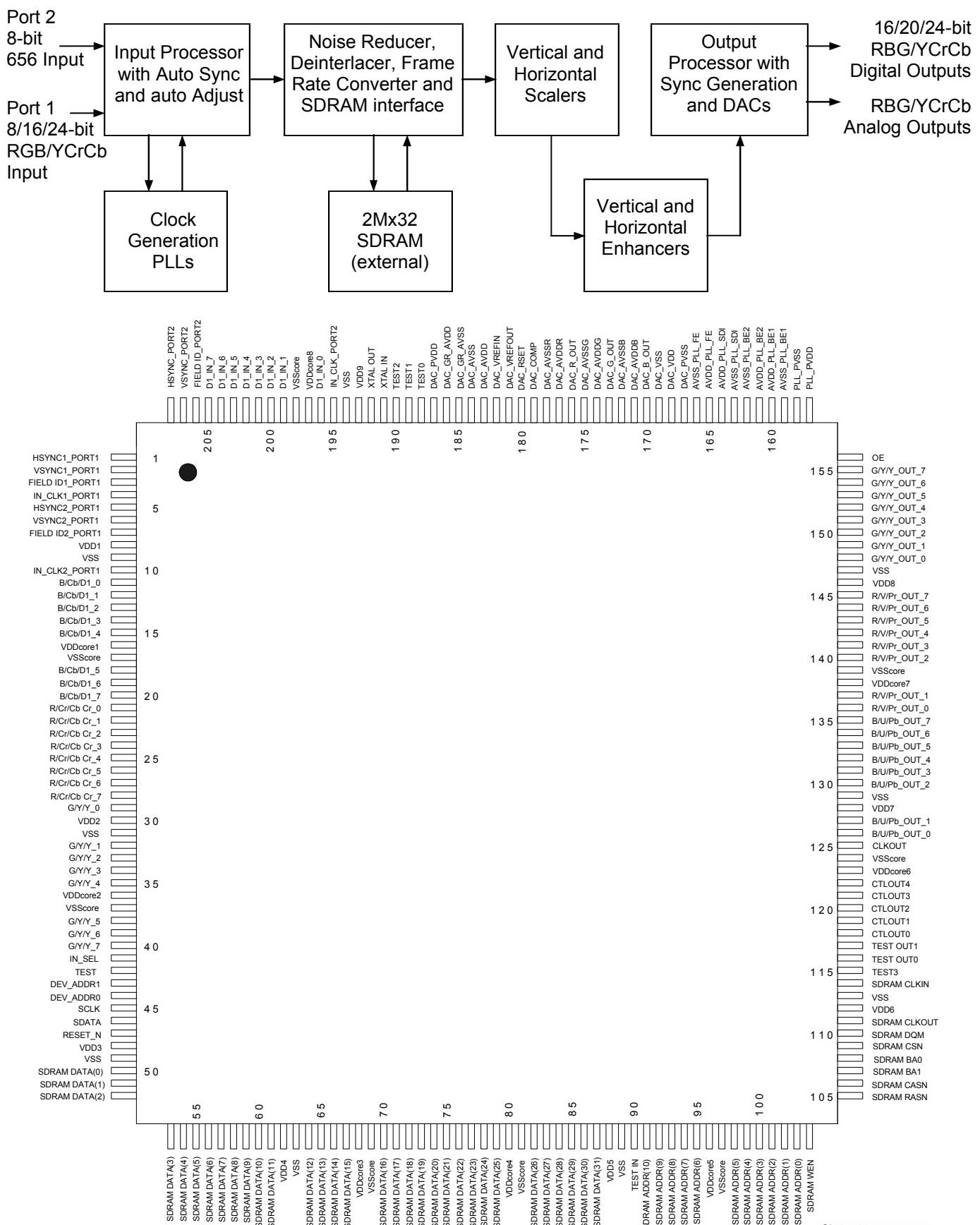


Figure 9-15 new Internal Block Diagram and Pin Layout

# 10. Spare Parts List

TV board	Part Number	Description	Value	Unit	Quantity	Part Number	Description	Value	Unit	Quantity
Various										
9122 785 90490	Repair kit Scaler board LC03					2315	3198 017 41050	1µF 10V 0603		
3104 311 06211	Cable 4p/080/4p					2316	3198 017 41050	1µF 10V 0603		
3139 110 38621	Cable 4p/80/4p					2317	4822 124 12084	1µF 20% 50V SMD		
3139 131 02631	Cable 22p/180/22p					2318	4822 126 13193	4.7nF 10% 63V		
3139 131 02751	Cable 4P/340/4p					2319	2238 586 59812	100nF 20-80% 50V 0603		
4822 265 11154	Connector 22p					2320	4822 126 14238	2.2nF 50V 0603		
3139 147 19701	UR1316/A I H-3					2321	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10735	Connector 3p m					2322	2238 586 59812	100nF 20-80% 50V 0603		
2422 025 11244	Connector 7p m					2324	3198 016 31020	1nF 25V 0603		
2422 025 12485	Connector 11p m					2325	4822 124 23002	10µF 20% 16V		
4822 267 10565	Connector 4p					2326	4822 126 14508	180pF 5% 50V		
4822 265 10703	Connector scart 21p					2327	5322 122 33861	120pF 10% 50V		
4822 265 10703	Connector scart 21p					2330	4822 122 33752	15pF 5% 50V		
2422 026 04754	Connector cinch 2p f					2331	4822 122 33752	15pF 5% 50V		
2422 026 05383	Connector cinch 2p f					2332	4822 122 33752	15pF 5% 50V		
4822 242 10685	Crystal 12MHz					2335	3198 016 38210	820pF 25V		
2422 549 44372	Filt. SAW 38.9MHz K3953L					2336	2238 916 15641	22nF 10% 25V 0603		
2422 549 44369	Filt. SAW 38.9MHz K9656L					2337	2238 916 15641	22nF 10% 25V 0603		
2422 543 01059	Xtal 18.432MHz					2338	2238 916 15641	22nF 10% 25V 0603		
2422 026 05449	Connector phone 1p f					2339	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10565	Connector 4p					2340	4822 122 33741	10pF 10% 50V		
2422 026 05427	Connector cinch 1p f					2341	3198 017 44740	470nF 10V 0603		
4822 267 10565	Connector 4p					2342	3198 017 44740	470nF 10V 0603		
2422 026 05449	Connector 1p f					2343	3198 017 44740	470nF 10V 0603		
4822 267 10565	Connector 4p					2344	2222 867 15339	33pF 5% 50V 0603		
2422 026 05427	Connector 1p f					2345	2222 867 15339	33pF 5% 50V 0603		
4822 267 10565	Connector 4p					2346	5322 126 11583	10nF 10% 50V 0603		
2422 026 05449	Connector 1p f					2347	5322 126 11583	10nF 10% 50V 0603		
4822 267 10565	Connector 4p					2348	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2349	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2350	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2351	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2361	4822 124 12095	100µF 20% 16V		
2422 026 05449	Connector 1p f					2380	4822 126 13881	470pF 5% 50V		
4822 267 10565	Connector 4p					2381	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2382	4822 126 13879	220nF 20% 16V		
4822 267 10565	Connector 4p					2390	4822 126 14238	2.2nF 50V 0603		
2422 026 05449	Connector 1p f					2391	4822 126 14241	330pF 50V 0603		
4822 267 10565	Connector 4p					2401	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2402	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2403	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2404	2238 916 15641	22nF 10% 25V 0603		
4822 267 10565	Connector 4p					2405	2238 916 15641	22nF 10% 25V 0603		
2422 026 05449	Connector 1p f					2407	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10565	Connector 4p					2408	2238 586 59812	100nF 20-80% 50V 0603		
2422 026 05449	Connector 1p f					2412	4822 126 13879	220nF 20% 16V		
4822 267 10565	Connector 4p					2415	4822 126 13879	220nF 20% 16V		
2422 026 05449	Connector 1p f					2417	4822 124 23002	10µF 20% 16V		
4822 267 10565	Connector 4p					2418	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2419	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2424	4822 124 23002	10µF 20% 16V		
2422 026 05449	Connector 1p f					2426	4822 124 23002	10µF 20% 16V		
4822 267 10565	Connector 4p					2428	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2429	3198 017 34730	47nF 16V 0603		
4822 267 10565	Connector 4p					2430	2238 586 59812	100nF 20-80% 50V 0603		
2422 026 05449	Connector 1p f					2432	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2433	2020 552 94427	100pF 5% 50V 0603		
2422 026 05449	Connector 1p f					2434	2020 552 94427	100pF 5% 50V 0603		
4822 267 10565	Connector 4p					2435	3198 017 34730	47nF 16V 0603		
2422 026 05449	Connector 1p f					2452	5322 126 11583	10nF 10% 50V 0603		
4822 267 10565	Connector 4p					2453	5322 126 11583	10nF 10% 50V 0603		
2422 026 05449	Connector 1p f					2470	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10565	Connector 4p					2471	5322 126 11583	10nF 10% 50V 0603		
2422 026 05449	Connector 1p f					2472	5322 126 11583	10nF 10% 50V 0603		
4822 267 10565	Connector 4p					2473	4822 126 13879	220nF 20% 16V		
2422 026 05449	Connector 1p f					2474	5322 126 11583	10nF 10% 50V 0603		
4822 267 10565	Connector 4p					2475	5322 126 11583	10nF 10% 50V 0603		
2422 026 05449	Connector 1p f					2476	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10565	Connector 4p					2477	5322 126 11583	10nF 10% 50V 0603		
2422 026 05449	Connector 1p f					2478	5322 126 11583	10nF 10% 50V 0603		
4822 267 10565	Connector 4p					2479	2020 024 90166	10µF 20% 35V		
2422 026 05449	Connector 1p f					2480	2020 024 90166	10µF 20% 35V		
4822 267 10565	Connector 4p					2481	2238 586 59812	100nF 20-80% 50V 0603		
2422 026 05449	Connector 1p f					2482	2020 552 94427	100pF 5% 50V 0603		
4822 267 10565	Connector 4p					2601	2238 586 59812	100nF 20-80% 50V 0603		
2422 026 05449	Connector 1p f					2602	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10565	Connector 4p					2603	2238 586 59812	100nF 20-80% 50V 0603		
2422 026 05449	Connector 1p f					2604	2238 586 59812	100nF 20-80% 50V 0603		
4822 267 10565	Connector 4p					2605	2238 586 59812	100nF 20-80% 50V 0603		
2422 026 05449	Connector 1p f					2610	4822 126 14226	82pF 5% 50V 0603		
4822 267 10565	Connector 4p					2611	4822 126 14226	82pF 5% 50V 0603		
2422 026 05449	Connector 1p f					2612	4822 126 14241	330pF 50V 0603		
4822 267 10565	Connector 4p					2613	4822 126 13881	470pF 5% 50V		
2422 026 05449	Connector 1p f					2620	4822 124 23002	10µF 20% 16V		
4822 267 10565	Connector 4p					2622	4822 126 11669	27pF 5% 50V 0603		
2422 026 05449	Connector 1p f					2623	4822 126 14225	56pF 5% 50V 0603		
4822 267 10565	Connector 4p					2624	4822 126 33752	15pF 5% 50V		
2422 026 05449	Connector 1p f					2625	4822 126 14508	180pF 5% 50V		
4822 267 10565	Connector 4p					2626	4822 126 11785	47pF 5% 50V 0603		
2422 026 05449	Connector 1p f					2627	4822 126 13193	4.7nF 10% 63V		
4822 267 10565	Connector 4p					2628	4822 126 13193	4.7nF 10% 63V		
2422 026 05449	Connector 1p f					2629	4822 126 13193	4.7nF 10% 63V		
4822 267 10565	Connector 4p					2630	4822 126 13193	4.7nF 10% 63V		
2422 026 05449	Connector 1p f					2631	4822 126 13193	4.7nF 10% 63V		
4822 267 10565	Connector 4p					2632	4822 126 13193	4.7nF 10% 63V		
2422 026 05449	Connector 1p f					2633	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2634	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2635	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2636	3198 017 41050	1µF 10V 0603		
2422 026 05449	Connector 1p f					2637	3198 017 41050	1µF 10V 0603		
4822 267 10565	Connector 4p					2638	3198 017 41050	1µF 10V		

-WV-		3218	4822 051 30759	75Ω 5% 0.062W	3413	4822 051 30102	1k 5% 0.062W	
3002	4822 117 12902	8k2 1% 0.063W 0603	3219	4822 051 30101	100Ω 5% 0.062W	3414	4822 051 30152	1k5 5% 0.062W
3003	4822 051 30103	10k 5% 0.062W	3221	4822 051 30759	75Ω 5% 0.062W	3415	4822 051 30152	1k5 5% 0.062W
3004	4822 117 12902	8k2 1% 0.063W 0603	3222	4822 051 30101	100Ω 5% 0.062W	3416	4822 051 30102	1k 5% 0.062W
3007	4822 117 12902	8k2 1% 0.063W 0603	3223	4822 051 30689	68Ω 5% 0.063W 0603	3417	4822 051 30109	10Ω 5% 0.062W
3009	4822 117 12902	8k2 1% 0.063W 0603	3224	4822 051 30102	1k 5% 0.062W	3418	4822 051 30109	10Ω 5% 0.062W
3010	4822 051 30222	2k2 5% 0.062W	3225	5322 117 11726	10Ω 5%	3426	4822 051 30102	1k 5% 0.062W
3013	4822 117 12902	8k2 1% 0.063W 0603	3226	4822 051 30759	75Ω 5% 0.062W	3427	4822 051 30102	1k 5% 0.062W
3014	4822 117 12902	8k2 1% 0.063W 0603	3227	4822 051 30109	10Ω 5% 0.062W	3428	4822 051 30102	1k 5% 0.062W
3015	4822 051 30103	10k 5% 0.062W	3228	4822 051 30101	100Ω 5% 0.062W	3429	4822 051 30109	10Ω 5% 0.062W
3016	4822 051 30102	1k 5% 0.062W	3231	4822 051 30151	150Ω 5% 0.062W	3430	4822 051 30101	100Ω 5% 0.062W
3017	4822 051 30101	100Ω 5% 0.062W	3232	4822 117 12891	220k 1% 0.063W 0603	3431	4822 051 30102	1k 5% 0.062W
3018	4822 051 30101	100Ω 5% 0.062W	3233	4822 051 30151	150Ω 5% 0.062W	3433	4822 051 30101	100Ω 5% 0.062W
3019	4822 051 30101	100Ω 5% 0.062W	3234	4822 117 12925	47k 1% 0.063W 0603	3434	4822 051 30101	100Ω 5% 0.062W
3021	4822 051 30101	100Ω 5% 0.062W	3236	4822 051 30151	150Ω 5% 0.062W	3436	4822 051 30102	1k 5% 0.062W
3022	4822 051 30222	2k2 5% 0.062W	3237	4822 117 12891	220k 1% 0.063W 0603	3437	4822 051 30101	100Ω 5% 0.062W
3023	4822 117 12902	8k2 1% 0.063W 0603	3238	4822 051 30151	150Ω 5% 0.062W	3455	4822 051 30682	6k8 5% 0.062W
3024	4822 051 30102	1k 5% 0.062W	3239	4822 117 12925	47k 1% 0.063W 0603	3456	4822 051 30222	2k2 5% 0.062W
3028	4822 117 12925	47k 1% 0.063W 0603	3241	4822 051 30223	22k 5% 0.062W	3457	4822 051 30273	27k 5% 0.062W
3029	4822 051 30103	10k 5% 0.062W	3242	4822 051 30682	6k8 5% 0.062W	3458	4822 051 30183	18k 5% 0.062W
3030	4822 051 30102	1k 5% 0.062W	3243	4822 051 30759	75Ω 5% 0.062W	3461	4822 051 30222	2k2 5% 0.062W
3031	4822 051 30471	470Ω 5% 0.062W	3244	4822 051 30109	10Ω 5% 0.062W	3470	4822 051 30008	Jumper 0603
3032	4822 051 30103	10k 5% 0.062W	3245	4822 051 30689	68Ω 5% 0.063W 0603	3471	4822 117 12891	220k 1% 0.063W 0603
3033	4822 051 30103	10k 5% 0.062W	3248	4822 051 30759	75Ω 5% 0.062W	3472	4822 051 30223	22k 5% 0.062W
3034	4822 051 30101	100Ω 5% 0.062W	3249	4822 051 30109	10Ω 5% 0.062W	3473	4822 051 30183	18k 5% 0.062W
3035	4822 051 30471	470Ω 5% 0.062W	3251	4822 117 12891	220k 1% 0.063W 0603	3474	4822 051 30223	22k 5% 0.062W
3037	4822 051 30101	100Ω 5% 0.062W	3252	4822 051 30151	150Ω 5% 0.062W	3475	4822 051 30153	15k 5% 0.062W
3042	4822 051 30151	150Ω 5% 0.062W	3253	4822 117 12891	220k 1% 0.063W 0603	3476	4822 051 30153	15k 5% 0.062W
3043	4822 051 30151	150Ω 5% 0.062W	3303	4822 051 30391	390Ω 5% 0.062W	3477	4822 051 30183	18k 5% 0.062W
3044	4822 051 30103	10k 5% 0.062W	3304	4822 051 30101	100Ω 5% 0.062W	3478	4822 051 30103	10k 5% 0.062W
3045	4822 051 30123	12k 5% 0.062W	3307	4822 051 30101	100Ω 5% 0.062W	3481	4822 051 30472	4k7 5% 0.062W
3046	4822 051 30472	4k7 5% 0.062W	3308	4822 051 30101	100Ω 5% 0.062W	3483	4822 051 30103	10k 5% 0.062W
3047	4822 051 30222	2k2 5% 0.062W	3309	4822 051 30109	10Ω 5% 0.062W	3484	4822 051 30103	10k 5% 0.062W
3048	4822 051 30222	2k2 5% 0.062W	3310	4822 051 30101	100Ω 5% 0.062W	3485	4822 051 30103	10k 5% 0.062W
3049	4822 051 30103	10k 5% 0.062W	3311	4822 051 30102	1k 5% 0.062W	3610	4822 051 30471	470Ω 5% 0.062W
3050	4822 051 30101	100Ω 5% 0.062W	3313	4822 051 30109	10Ω 5% 0.062W	3611	4822 117 12925	47k 1% 0.063W 0603
3051	4822 117 13525	24k 1% 0.62W 0603	3314	4822 051 30102	1k 5% 0.062W	3620	4822 051 30101	100Ω 5% 0.062W
3053	4822 051 30103	10k 5% 0.062W	3315	4822 051 30471	470Ω 5% 0.062W	3621	4822 051 30101	100Ω 5% 0.062W
3054	4822 051 30103	10k 5% 0.062W	3316	4822 051 30681	680Ω 5% 0.062W	3622	4822 051 30222	2k2 5% 0.062W
3056	4822 117 12925	47k 1% 0.063W 0603	3317	4822 051 30153	15k 5% 0.062W	3627	4822 117 13632	100k 1% 0603 0.62W
3058	4822 051 30471	470Ω 5% 0.062W	3318	4822 051 30273	27k 5% 0.062W	3628	4822 051 30154	150k 5% 0.062W
3059	4822 051 30151	150Ω 5% 0.062W	3319	4822 051 30103	10k 5% 0.062W	3629	4822 051 30102	1k 5% 0.062W
3060	4822 051 30103	10k 5% 0.062W	3321	4822 051 30332	3k3 5% 0.062W	3630	4822 117 13632	100k 1% 0603 0.62W
3061	4822 051 30471	470Ω 5% 0.062W	3324	4822 051 30393	39k 5% 0.062W	3631	4822 051 30154	150k 5% 0.062W
3062	4822 117 12925	47k 1% 0.063W 0603	3326	2120 108 91909	39Ω 5% 0.0603	3632	4822 051 30102	1k 5% 0.062W
3063	4822 051 30222	2k2 5% 0.062W	3327	4822 051 30102	1k 5% 0.062W	3634	4822 051 30102	1k 5% 0.062W
3064	4822 051 30472	4k7 5% 0.062W	3328	4822 051 30152	1k5 5% 0.062W	3635	4822 051 30102	1k 5% 0.062W
3065	4822 051 30472	4k7 5% 0.062W	3330	4822 051 30102	1k 5% 0.062W	3636	4822 051 30102	1k 5% 0.062W
3066	4822 117 12902	8k2 1% 0.063W 0603	3331	4822 051 30101	100Ω 5% 0.062W	3637	4822 051 30102	1k 5% 0.062W
3068	4822 117 12925	47k 1% 0.063W 0603	3332	4822 051 30101	100Ω 5% 0.062W	3638	4822 051 30102	1k 5% 0.062W
3069	4822 051 30153	15k 5% 0.062W	3333	4822 051 30151	150Ω 5% 0.062W	3640	4822 051 30102	1k 5% 0.062W
3070	4822 051 30273	27k 5% 0.062W	3335	4822 051 30151	150Ω 5% 0.062W	3645	4822 051 30102	1k 5% 0.062W
3071	4822 117 13632	100k 1% 0603 0.62W	3339	4822 051 30101	100Ω 5% 0.062W	3646	4822 051 30102	1k 5% 0.062W
3072	4822 117 13632	100k 1% 0603 0.62W	3340	4822 051 30101	100Ω 5% 0.062W	3650	4822 051 30223	22k 5% 0.062W
3081	4822 051 30472	4k7 5% 0.062W	3341	4822 051 30101	100Ω 5% 0.062W	3651	4822 051 30101	100Ω 5% 0.062W
3082	4822 051 30103	10k 5% 0.062W	3342	4822 051 30101	100Ω 5% 0.062W	3652	4822 051 30101	100Ω 5% 0.062W
3083	4822 051 30471	470Ω 5% 0.062W	3345	4822 051 30101	100Ω 5% 0.062W	3653	4822 051 30101	100Ω 5% 0.062W
3084	4822 051 30101	100Ω 5% 0.062W	3346	4822 051 30102	1k 5% 0.062W	3654	4822 051 30101	100Ω 5% 0.062W
3085	4822 051 30101	100Ω 5% 0.062W	3347	4822 051 30101	100Ω 5% 0.062W	3655	4822 051 30101	100Ω 5% 0.062W
3086	4822 051 30101	100Ω 5% 0.062W	3348	4822 051 30109	10Ω 5% 0.062W	3732	4822 117 12891	220k 1% 0.063W 0603
3088	4822 051 30101	100Ω 5% 0.062W	3349	4822 051 30101	100Ω 5% 0.062W	3735	4822 051 30273	27k 5% 0.062W
3092	4822 051 30101	100Ω 5% 0.062W	3350	4822 051 30109	10Ω 5% 0.062W	3736	4822 051 30682	6k8 5% 0.062W
3094	4822 051 30103	10k 5% 0.062W	3351	4822 051 30271	270Ω 5% 0.062W	3740	4822 051 30273	27k 5% 0.062W
3100	4822 051 30008	Jumper 0603	3352	4822 051 30151	150Ω 5% 0.062W	3741	4822 051 30682	6k8 5% 0.062W
3101	4822 051 30008	Jumper 0603	3354	4822 051 30271	270Ω 5% 0.062W	3743	4822 051 30102	1k 5% 0.062W
3102	4822 051 30103	10k 5% 0.062W	3355	4822 051 30151	150Ω 5% 0.062W	3744	4822 051 30472	4k7 5% 0.062W
3103	4822 051 30152	1k5 5% 0.062W	3357	4822 051 30271	270Ω 5% 0.062W	3745	4822 051 30332	3k3 5% 0.062W
3120	4822 051 30479	47Ω 5% 0.062W	3358	4822 051 30151	150Ω 5% 0.062W	3746	4822 051 30102	1k 5% 0.062W
3121	4822 051 30273	27k 5% 0.062W	3360	4822 051 30008	Jumper 0603	3750	4822 051 30471	470Ω 5% 0.062W
3122	4822 117 13632	100k 1% 0603 0.62W	3380	4822 051 30223	22k 5% 0.062W	3752	4822 051 30471	470Ω 5% 0.062W
3130	4822 117 11817	1k2 1% 1/16W	3381	4822 051 30562	5k6 5% 0.063W 0603	3755	4822 051 30101	100Ω 5% 0.062W
3131	4822 051 30271	270Ω 5% 0.062W	3382	4822 051 30103	10k 5% 0.062W	3757	4822 051 30103	10k 5% 0.062W
3132	4822 117 13632	100k 1% 0603 0.62W	3383	4822 051 30472	4k7 5% 0.062W	3758	4822 051 30472	4k7 5% 0.062W
3133	4822 117 12968	820Ω 5% 0.62W	3384	4822 051 30472	4k7 5% 0.062W	3759	4822 051 30102	1k 5% 0.062W
3134	4822 117 13632	100k 1% 0603 0.62W	3385	4822 051 30471	470Ω 5% 0.062			

3931	4822 117 12917	1Ω 5% 0.062W 0603
3932	5322 117 13018	1kΩ 1% 0.063W 0603
3933	5322 117 13048	3kΩ 1% 0.063W 0603
4008	4822 051 30008	Jumper 0603
4036	4822 051 30008	Jumper 0603
4057	4822 051 30008	Jumper 0603
4201	4822 051 30008	Jumper 0603
4202	4822 051 30008	Jumper 0603
4203	4822 051 30008	Jumper 0603
4302	4822 051 20008	Jumper 0805
4303	4822 051 20008	Jumper 0805
4320	4822 051 20008	Jumper 0805
4323	4822 051 20008	Jumper 0805
4451	4822 051 30008	Jumper 0603
4455	4822 051 30008	Jumper 0603
4457	4822 051 30008	Jumper 0603
4458	4822 051 30008	Jumper 0603
4601	4822 051 30008	Jumper 0603
4602	4822 051 30008	Jumper 0603
4604	4822 051 30008	Jumper 0603
4614	4822 051 30008	Jumper 0603
4620	4822 051 30008	Jumper 0603
4691	4822 051 30008	Jumper 0603
4740	4822 051 20008	Jumper 0805

7022	3198 010 42310	BC847BW
7053	9340 425 20115	BC847BS
7062	3198 010 42310	BC847BW
7063	3198 010 42310	BC847BW
7064	9965 000 18102	LC03E21-2.00 (West-Europe)
7064	9965 000 18103	LC03E22-2.00 (East-Europe)
7066	9322 156 81668	M24C32-WM6TNKSA
7067	3198 010 42310	BC847BW
7068	3198 010 42310	BC847BW
7069	3198 010 42310	BC847BW
7070	9322 189 28668	CY7C1019CV33-15ZC
7120	3198 010 42310	BC847BW
7130	5322 130 42718	BFS20
7131	5322 130 42718	BFS20
7224	5322 130 60159	BC846B
7301	9352 626 19557	TDA885
7302	3198 010 42310	BC847BW
7303	3198 010 42310	BC847BW
7330	3198 010 42310	BC847BW
7350	3198 010 42310	BC847BW
7353	3198 010 42310	BC847BW
7356	3198 010 42310	BC847BW
7380	3198 010 42310	BC847BW
7381	3198 010 42310	BC847BW
7382	3198 010 42310	BC847BW
7383	3198 010 42310	BC847BW
7384	3198 010 42310	BC847BW
7385	3198 010 42310	BC847BW
7390	3198 010 42310	BC847BW
7391	3198 010 42310	BC847BW
7401	9351 869 40118	74HC4053PW
7403	9352 632 26118	TDA9171T/N1
7405	9352 630 99118	TDA9181T
7412	9340 425 20115	BC847BS
7427	3198 010 42310	BC847BW
7428	3198 010 42310	BC847BW
7452	3198 010 42310	BC847BW
7471	3198 010 42310	BC847BW
7473	3198 010 42310	BC847BW
7601	9322 167 76668	TC74HC590AF
7602	9322 167 76668	TC74HC590AF
7603	4822 209 91023	UM62256EM-70LL
7604	5322 209 31276	SN74HCT573DW
7605	5322 209 31276	SN74HCT573DW
7610	3198 010 42310	BC847BW
7620	9322 192 05671	MSP3411G-Q1-C12
7627	5322 130 60159	BC846B
7630	5322 130 60159	BC846B
7647	4822 130 63732	MMUN2212
7675	4822 130 63732	MMUN2212
7676	4822 130 63732	MMUN2212
7677	4822 130 63732	MMUN2212
7678	4822 130 63732	MMUN2212
7679	4822 130 63732	MMUN2212
7680	9351 869 40118	74HC4053PW
7731	9322 181 41682	AN7522N
7732	9352 500 20118	74LVC08AD
7744	3198 010 42310	BC847BW
7756	5322 130 60159	BC846B
7900	9322 157 51685	SI12301DS
7901	4822 130 11155	PDT114ET
7903	5322 130 60159	BC846B
7904	5322 130 60159	BC846B
7910	4822 209 60059	MC34063AP1
7920	4822 209 60059	MC34063AP1
7930	4822 209 60059	MC34063AP1

8402	3139 131 02761	Cable 7p/440/7p
2001	2238 586 59812	100nF 20-80% 50V 0603
2002	2238 586 59812	100nF 20-80% 50V 0603
2003	4822 124 80151	47μF 20% 16V
2004	2238 586 59812	100nF 20-80% 50V 0603
2005	2238 586 59812	100nF 20-80% 50V 0603
2006	4822 124 80151	47μF 20% 16V
2007	4822 124 11767	470μF 20% 25V
2008	4822 124 11767	470μF 20% 25V
2009	4822 124 11767	470μF 20% 25V
2011	2020 552 96507	10μF 10V
2012	2238 586 59812	100nF 20-80% 50V 0603
2013	4822 124 80151	47μF 20% 16V
2014	2020 552 96507	10μF 10V
2015	4822 124 11767	470μF 20% 25V
2016	2238 586 59812	100nF 20-80% 50V 0603
2017	2238 586 59812	100nF 20-80% 50V 0603
2018	4822 124 80151	47μF 20% 16V
2021	5322 126 11583	10nF 10% 50V 0603
2022	5322 126 11578	1nF 10% 50V 0603
2024	4822 124 11767	470μF 20% 25V
2201	2238 586 59812	100nF 20-80% 50V 0603
2202	4822 126 14223	2.2pF +-0.25pF 50V 0603
2203	2020 552 94427	100pF 5% 50V 0603
2204	2020 552 94427	100pF 5% 50V 0603
2205	2238 586 59812	100nF 20-80% 50V 0603
2206	2238 586 59812	100nF 20-80% 50V 0603
2208	3198 017 41050	1μF 10V 0603
2211	3198 017 41050	1μF 10V 0603
2212	4822 126 14223	2.2pF +-0.25pF 50V 0603
2213	3198 017 41050	1μF 10V 0603
2214	4822 126 14223	2.2pF +-0.25pF 50V 0603
2215	2238 586 59812	100nF 20-80% 50V 0603
2216	2238 586 59812	100nF 20-80% 50V 0603
2217	2020 552 96507	10μF 10V
2218	4822 126 14491	2.2μF -20+80% 10V 0805
2219	2238 586 59812	100nF 20-80% 50V 0603
2221	2238 586 59812	100nF 20-80% 50V 0603
2222	4822 126 14241	330pF 50V 0603
2223	4822 126 14241	330pF 50V 0603
2224	4822 126 14241	330pF 50V 0603
2225	2020 552 96507	10μF 10V
2226	2020 552 96507	10μF 10V
2227	2238 586 59812	100nF 20-80% 50V 0603
2228	2238 586 59812	100nF 20-80% 50V 0603
2229	2238 586 59812	100nF 20-80% 50V 0603
2315	3198 017 34730	47nF 16V 0603
2316	3198 017 34730	47nF 16V 0603
2317	3198 017 34730	47nF 16V 0603
2318	3198 017 34730	47nF 16V 0603
2319	3198 017 34730	47nF 16V 0603
2321	2020 552 96507	10μF 10V
2233	2238 586 59812	100nF 20-80% 50V 0603
2324	2238 586 59812	100nF 20-80% 50V 0603
2325	2020 552 96507	10μF 10V
2326	2020 552 96507	10μF 10V
2327	2238 586 59812	100nF 20-80% 50V 0603
2328	2238 586 59812	100nF 20-80% 50V 0603
2329	2238 586 59812	100nF 20-80% 50V 0603
2331	2238 586 59812	100nF 20-80% 50V 0603
2332	2238 586 59812	100nF 20-80% 50V 0603
2333	2238 586 59812	100nF 20-80% 50V 0603
2334	4822 122 33752	15pF 5% 50V
2335	4822 122 33752	15pF 5% 50V
2338	2238 586 59812	100nF 20-80% 50V 0603
2339	2238 586 59812	100nF 20-80% 50V 0603
2341	2020 552 96507	10μF 10V
2342	2238 586 59812	100nF 20-80% 50V 0603
2343	2238 586 59812	100nF 20-80% 50V 0603
2344	4822 124 80151	47μF 20% 16V
2345	2238 586 59812	100nF 20-80% 50V 0603
2346	2238 586 59812	100nF 20-80% 50V 0603
2347	2238 586 59812	100nF 20-80% 50V 0603
2351	2020 552 96507	10μF 10V
2352	2020 552 96507	10μF 10V
2353	2238 586 59812	100nF 20-80% 50V 0603
2354	2020 552 96507	10μF 10V
2355	2020 552 96507	10μF 10V
2356	2222 867 15339	33pF 5% 50V 0603
2357	2020 552 96507	10μF 10V
2358	2222 867 15339	33pF 5% 50V 0603
2359	2238 586 59812	100nF 20-80% 50V 0603
2361	2020 552 96507	10μF 10V
2362	2238 586 59812	100nF 20-80% 50V 0603
2363	2238 586 59812	100nF 20-80% 50V 0603
2364	2238 586 59812	100nF 20-80% 50V 0603
2365	2238 586 59812	100nF 20-80% 50V 0603
2366	2238 586 59812	100nF 20-80% 50V 0603
2367	2238 586 59812	100nF 20-80% 50V 0603
2368	2238 586 59812	100nF 20-80% 50V 0603
2369	2238 586 59812	100nF 20-80% 50V 0603

### Scaler board

#### Various

1001	8238 277 11021	Socket power 1p f
1002	8238 277 10841	Fuse 7A 125V
1003	4822 267 10565	Connector 4p
1201	2438 031 00416	Connector 15p f
1283	2422 026 05383	Connector cinch 2p f
1301	2422 543 01352	Xtal 24.576MHz 30pF SMD-49
1351	2422 543 01246	Xtal 13.5MHz 12pF DSX840
1352	2422 025 08149	Connector 6p m
1401	2722 171 08799	Xtal 14.318MHz 20pF FXO-31
1402	4822 265 11352	Connector 8p
1506	2422 025 18024	Connector 40p m
1681	4822 265 11154	Connector 22p
1751	4822 267 10637	Connector 5P m v 2.00
1752	2422 025 09406	Connector 4p
1753	2422 543 01133	Xtal 14.318MHz 20pF SMD-49

2371	2238 586 59812	100nF 20-80% 50V 0603	2494	2238 586 59812	100nF 20-80% 50V 0603	3356	4822 051 30471	470Ω 5% 0.062W
2372	2238 586 59812	100nF 20-80% 50V 0603	2495	2238 586 59812	100nF 20-80% 50V 0603	3357	4822 051 30471	470Ω 5% 0.062W
2373	2238 586 59812	100nF 20-80% 50V 0603	2501	4822 126 13879	220nF 20% 16V	3359	4822 051 30103	10k 5% 0.062W
2374	2238 586 59812	100nF 20-80% 50V 0603	2512	4822 126 13879	220nF 20% 16V	3361	4822 051 30103	10k 5% 0.062W
2375	2238 586 59812	100nF 20-80% 50V 0603	2513	4822 126 13879	220nF 20% 16V	3362	4822 051 30103	10k 5% 0.062W
2376	2020 552 96507	10μF 10V	2516	5322 126 11583	10nF 10% 50V 0603	3363	4822 051 30103	10k 5% 0.062W
2377	2020 552 96507	10μF 10V	2517	5322 126 11583	10nF 10% 50V 0603	3364	4822 051 30474	470k 5% 0.062W
2378	2238 586 59812	100nF 20-80% 50V 0603	2518	5322 126 11583	10nF 10% 50V 0603	3365	4822 051 30181	180Ω 5% 0.062W
2379	2238 586 59812	100nF 20-80% 50V 0603	2521	4822 126 13879	220nF 20% 16V	3366	4822 117 12917	1Ω 5% 0.062W 0603
2381	2020 552 96507	10μF 10V	2751	2238 586 59812	100nF 20-80% 50V 0603	3368	4822 051 30472	4k7 5% 0.062W
2382	2238 586 59812	100nF 20-80% 50V 0603	2752	2020 552 96507	10μF 10V	3369	4822 051 30103	10k 5% 0.062W
2383	2238 586 59812	100nF 20-80% 50V 0603	2753	4822 122 33752	15pF 5% 50V	3371	4822 117 12139	22Ω 5% 0.062W
2384	2238 586 59812	100nF 20-80% 50V 0603	2754	4822 122 33752	15pF 5% 50V	3372	4822 117 13573	4 × 47Ω 5%
2385	2238 586 59812	100nF 20-80% 50V 0603	2755	2020 552 96507	10μF 10V	3373	4822 117 13573	4 × 47Ω 5%
2386	2238 586 59812	100nF 20-80% 50V 0603	2756	2238 586 59812	100nF 20-80% 50V 0603	3374	4822 117 13573	4 × 47Ω 5%
2387	2238 586 59812	100nF 20-80% 50V 0603	2757	2238 586 59812	100nF 20-80% 50V 0603	3375	4822 117 13573	4 × 47Ω 5%
2388	2238 586 59812	100nF 20-80% 50V 0603	2758	2238 586 59812	100nF 20-80% 50V 0603	3376	4822 117 13573	4 × 47Ω 5%
2389	2238 586 59812	100nF 20-80% 50V 0603				3377	4822 117 13573	4 × 47Ω 5%
2391	2020 552 96507	10μF 10V				3381	4822 117 12139	22Ω 5% 0.062W
2392	2238 586 59812	100nF 20-80% 50V 0603				3382	4822 051 30472	4k7 5% 0.062W
2393	2238 586 59812	100nF 20-80% 50V 0603	3001	4822 051 30103	10k 5% 0.062W	3388	4822 051 30759	75Ω 5% 0.062W
2394	2238 586 59812	100nF 20-80% 50V 0603	3002	4822 051 30472	4k7 5% 0.062W	3389	4822 051 30759	75Ω 5% 0.062W
2395	2020 552 96507	10μF 10V	3003	4822 117 12925	47k 1% 0.063W 0603	3391	4822 051 30759	75Ω 5% 0.062W
2396	2238 586 59812	100nF 20-80% 50V 0603	3004	4822 051 30223	22k 5% 0.062W	3392	4822 117 12917	1Ω 5% 0.062W 0603
2397	2238 586 59812	100nF 20-80% 50V 0603	3005	4822 051 30103	10k 5% 0.062W	3393	4822 117 12917	1Ω 5% 0.062W 0603
2401	3198 016 31020	1nF 25V 0603	3006	4822 051 30223	22k 5% 0.062W	3394	4822 117 12917	1Ω 5% 0.062W 0603
2402	5322 126 11578	1nF 10% 50V 0603	3011	2322 704 65101	510Ω 1%	3395	4822 117 12917	1Ω 5% 0.062W 0603
2403	2238 586 59812	100nF 20-80% 50V 0603	3012	2322 704 65101	510Ω 1%	3401	4822 051 30109	10Ω 5% 0.062W
2404	2238 586 59812	100nF 20-80% 50V 0603	3014	4822 051 30103	10k 5% 0.062W	3402	4822 051 30109	10Ω 5% 0.062W
2405	2238 586 59812	100nF 20-80% 50V 0603	3016	4822 117 12917	1Ω 5% 0.062W 0603	3403	4822 051 30109	10Ω 5% 0.062W
2407	2238 586 59812	100nF 20-80% 50V 0603	3017	4822 117 12925	47k 1% 0.063W 0603	3404	4822 051 30151	150Ω 5% 0.062W
2408	2238 586 59812	100nF 20-80% 50V 0603	3018	4822 051 30223	22k 5% 0.062W	3405	4822 051 30101	100Ω 5% 0.062W
2409	2238 586 59812	100nF 20-80% 50V 0603	3201	4822 051 30472	4k7 5% 0.062W	3406	4822 051 30103	10k 5% 0.062W
2411	2238 586 59812	100nF 20-80% 50V 0603	3202	4822 117 12925	47k 1% 0.063W 0603	3407	4822 051 30103	10k 5% 0.062W
2412	2238 586 59812	100nF 20-80% 50V 0603	3203	4822 051 30103	10k 5% 0.062W	3408	4822 051 30103	10k 5% 0.062W
2413	2238 586 59812	100nF 20-80% 50V 0603	3205	4822 051 30222	2k2 5% 0.062W	3409	4822 051 30103	10k 5% 0.062W
2414	2238 586 59812	100nF 20-80% 50V 0603	3206	4822 051 30222	2k2 5% 0.062W	3411	4822 117 13573	4 × 47Ω 5%
2415	2238 586 59812	100nF 20-80% 50V 0603	3208	4822 051 30101	100Ω 5% 0.062W	3412	4822 117 13573	4 × 47Ω 5%
2416	2238 586 59812	100nF 20-80% 50V 0603	3209	4822 051 30008	Jumper 0603	3413	4822 117 13573	4 × 47Ω 5%
2417	2238 586 59812	100nF 20-80% 50V 0603	3211	4822 051 30103	10k 5% 0.062W	3414	4822 117 13573	4 × 47Ω 5%
2421	2020 552 96507	10μF 10V	3212	4822 051 30103	10k 5% 0.062W	3415	4822 117 13573	4 × 47Ω 5%
2422	2238 586 59812	100nF 20-80% 50V 0603	3213	4822 051 30221	220Ω 5% 0.062W	3416	4822 117 12139	22Ω 5% 0.062W
2423	2020 552 96507	10μF 10V	3214	4822 051 30221	220Ω 5% 0.062W	3417	4822 051 30103	10k 5% 0.062W
2424	2238 586 59812	100nF 20-80% 50V 0603	3215	4822 051 30101	100Ω 5% 0.062W	3418	4822 051 30103	10k 5% 0.062W
2425	2238 586 59812	100nF 20-80% 50V 0603	3216	4822 051 30101	100Ω 5% 0.062W	3422	4822 051 30221	220Ω 5% 0.062W
2427	2238 586 59812	100nF 20-80% 50V 0603	3217	4822 051 30759	75Ω 5% 0.062W	3424	3198 031 11010	4 × 100Ω 5% 1206
2428	3198 016 31020	1nF 25V 0603	3218	4822 051 30759	75Ω 5% 0.062W	3427	4822 117 12139	22Ω 5% 0.062W
2429	2238 586 59812	100nF 20-80% 50V 0603	3219	4822 051 30101	100Ω 5% 0.062W	3428	4822 051 30479	47Ω 5% 0.062W
2431	2238 586 59812	100nF 20-80% 50V 0603	3221	4822 051 30151	150Ω 5% 0.062W	3429	4822 051 30103	10k 5% 0.062W
2432	2238 586 59812	100nF 20-80% 50V 0603	3222	4822 051 30759	75Ω 5% 0.062W	3431	4822 051 30472	4k7 5% 0.062W
2434	2238 586 59812	100nF 20-80% 50V 0603	3223	4822 051 30101	100Ω 5% 0.062W	3432	4822 051 30472	4k7 5% 0.062W
2435	2020 552 96507	10μF 10V	3224	4822 051 30101	100Ω 5% 0.062W	3433	4822 117 12925	47k 1% 0.063W 0603
2436	2020 552 96507	10μF 10V	3225	4822 051 30101	100Ω 5% 0.062W	3434	4822 117 12925	47k 1% 0.063W 0603
2437	2238 586 59812	100nF 20-80% 50V 0603	3226	4822 051 30151	150Ω 5% 0.062W	3436	4822 051 30008	Jumper 0603
2439	2238 586 59812	100nF 20-80% 50V 0603	3227	4822 051 30689	68Ω 5% 0.063W 0603	3437	4822 051 30008	Jumper 0603
2441	2238 586 59812	100nF 20-80% 50V 0603	3228	4822 051 30689	68Ω 5% 0.063W 0603	3441	3198 031 11010	4 × 100Ω 5% 1206
2442	2238 586 59812	100nF 20-80% 50V 0603	3229	4822 051 30689	68Ω 5% 0.063W 0603	3442	3198 031 11010	4 × 100Ω 5% 1206
2443	2020 552 96507	10μF 10V	3231	4822 117 12139	22Ω 5% 0.062W	3443	3198 031 11010	4 × 100Ω 5% 1206
2444	2238 586 59812	100nF 20-80% 50V 0603	3232	4822 051 30154	150k 5% 0.062W	3444	3198 031 11010	4 × 100Ω 5% 1206
2445	2020 552 96507	10μF 10V	3233	4822 051 30689	68Ω 5% 0.063W 0603	3445	3198 031 11010	4 × 100Ω 5% 1206
2446	3198 016 31020	1nF 25V 0603	3234	4822 117 12902	8k2 1% 0.063W 0603	3446	3198 031 11010	4 × 100Ω 5% 1206
2447	2020 552 96507	10μF 10V	3235	4822 051 30154	150k 5% 0.062W	3507	4822 051 30103	10k 5% 0.062W
2448	2020 552 96507	10μF 10V	3236	4822 051 30392	3k9 5% 0.063W 0603	3511	4822 051 30103	10k 5% 0.062W
2449	3198 016 31020	1nF 25V 0603	3237	4822 051 30561	56Ω 5% 0.062W	3516	4822 051 30109	10Ω 5% 0.062W
2451	2238 586 59812	100nF 20-80% 50V 0603	3238	4822 051 30154	150k 5% 0.062W	3517	4822 051 30109	10Ω 5% 0.062W
2452	2020 552 96507	10μF 10V	3239	4822 051 30689	68Ω 5% 0.063W 0603	3751	4822 051 30472	4k7 5% 0.062W
2461	4822 126 14238	2.2nF 50V 0603	3240	4822 051 30689	68Ω 5% 0.063W 0603	3752	4822 051 30472	4k7 5% 0.062W
2462	2020 552 96507	10μF 10V	3241	4822 051 30689	68Ω 5% 0.063W 0603	3753	4822 051 30101	100Ω 5% 0.062W
2463	3198 016 35680	5.6pF +/- 0.5pF 50V 0603 NPO	3251	4822 051 30102	1k 5% 0.062W	3754	4822 051 30101	100Ω 5% 0.062W
2466	4822 126 14238	2.2nF 50V 0603	3252	4822 051 30273	27k 5% 0.062W	3755	4822 051 30472	4k7 5% 0.062W
2467	4822 126 14238	2.2nF 50V 0603	3254	4822 051 30273	27k 5% 0.062W	3756	4822 051 30008	Jumper 0603
2471	2238 586 59812	100nF 20-80% 50V 0603	3304	4822 051 30151	150Ω 5% 0.062W	3762	4822 051 30008	Jumper 0603
2472	2238 586 59812	100nF 20-80% 50V 0603	3305	4822 051 30151	150Ω 5% 0.062W	3764	4822 051 30103	10k 5% 0.062W
2474								



3173 4822 051 30103 10k 5% 0.062W  
3174 4822 051 30391 390Ω 5% 0.062W  
3175 4822 051 30103 10k 5% 0.062W  
3176 4822 051 30391 390Ω 5% 0.062W  
3177 4822 051 30221 220Ω 5% 0.062W



6175 9322 192 35676 SPR-325MVW  
6177 9322 189 66667 TSOP1836LL3V



7173 4822 130 60373 BC856B  
7175 4822 130 60373 BC856B

## 11. Revision List

First release